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Improved Corliss Engine.

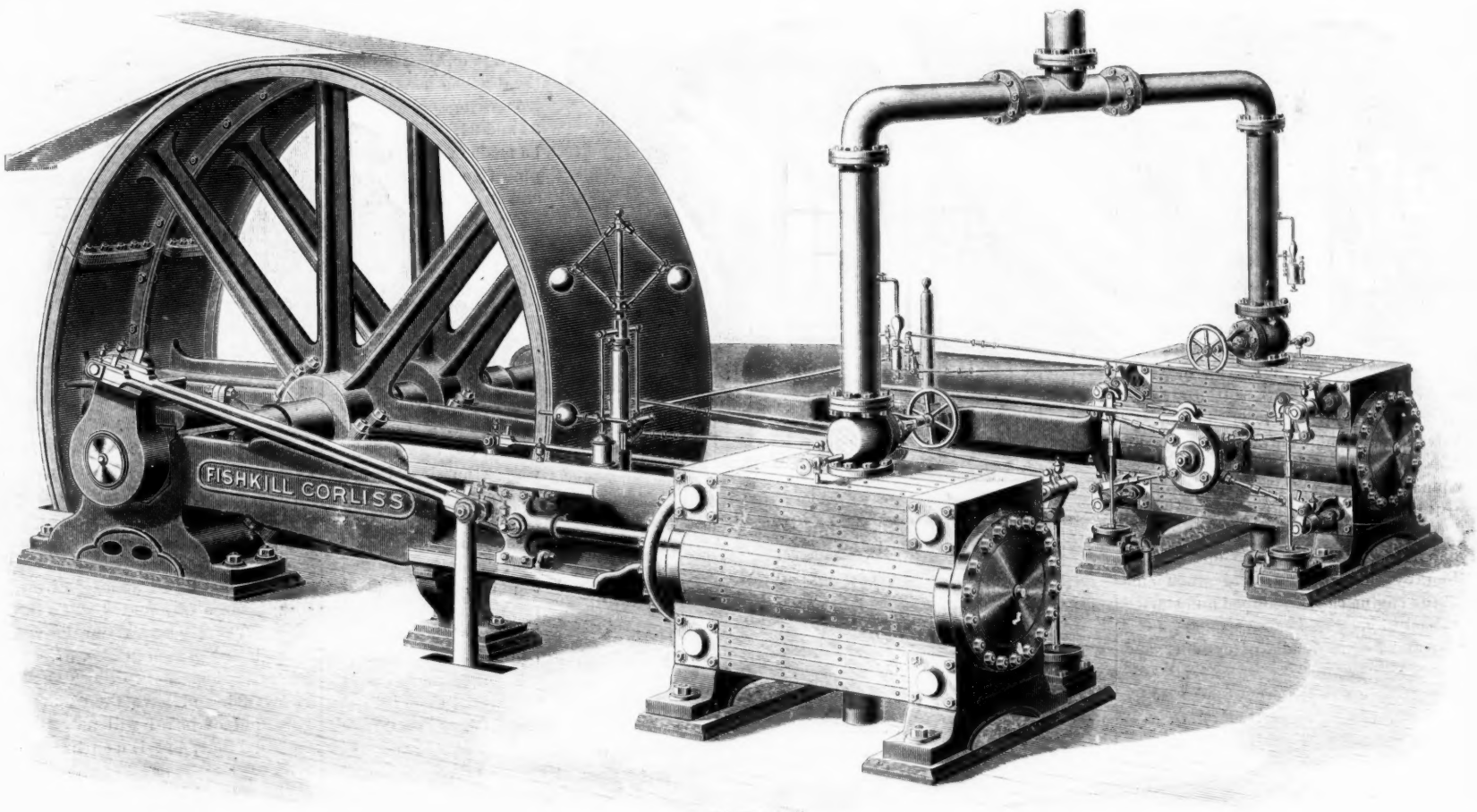
We illustrate with this a double engine by the Fishkill Landing Machine Company, Fishkill-on-the-Hudson, N. Y., and on pages 1, 2 and 3 such details as represent, especially, the practice of the company named.

In the detail engravings, Figs. 1, 2, 3, 4 and 5 represent the releasing valve gear, Fig. 1 being a front elevation, Fig. 2 a plan and Figs. 3, 4 and 5 rear elevations. Fig 3 shows the parts in engagement when the valve begins to open, Fig. 4 shows the position of parts after the valve has been released, and Fig. 5 illustrates the action of the stop motion.

In all these figures A represents the valve-stem, and B the valve-lever which is secured to end of valve-stem by feather and set screw. CC' is a double crank which vibrates loosely on a sleeve around the valve-stem, and is connected by an adjustable link-rod to the wrist-plate, from which it receives its motion. The end of the arm C carries a small rock-shaft D which has a hook E fastened on one end. This hook is provided with a hardened steel catch-plate b, which engages a similar plate c fastened on the end of valve-lever B, and the hook is kept in place by a light spring f.

On the end of the rock-shaft D, opposite the hook E, is fixed a forked crank F, having a pin h on which is mounted a sliding-block s, and the outside of block s is fitted to move in a slot i of the link G. The link is mounted at and vibrates about a point j in one arm of a bell-crank H, and the bell-crank oscillates upon a sleeve around the valve-stem. The other arm of the bell-crank H is connected by an adjustable rod z to the governor.

By referring to Fig. 3 in which the double crank CC' is moved by the wrist-plate in the direction indicated by the arrow, and following the motion of the inner end of the block s, and also of the inner end of the slot i, it will be seen that these points will come together when the curved dotted lines 2 and 3 cross each other, and as the movement continues, the block s will be



IMPROVED CORLISS ENGINE.

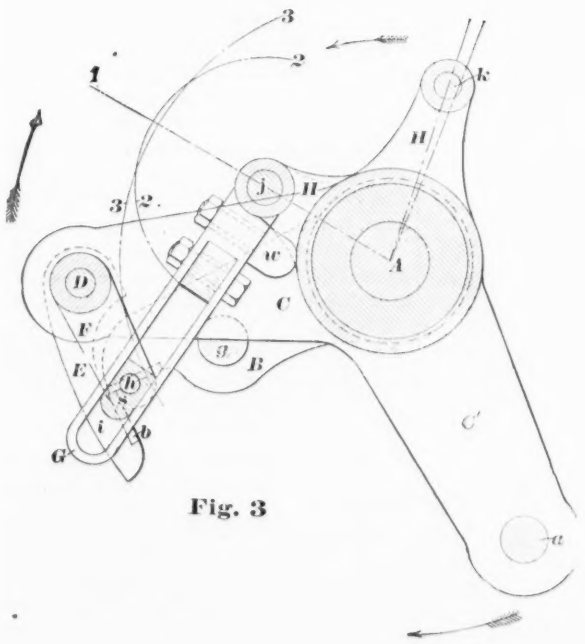


Fig. 3

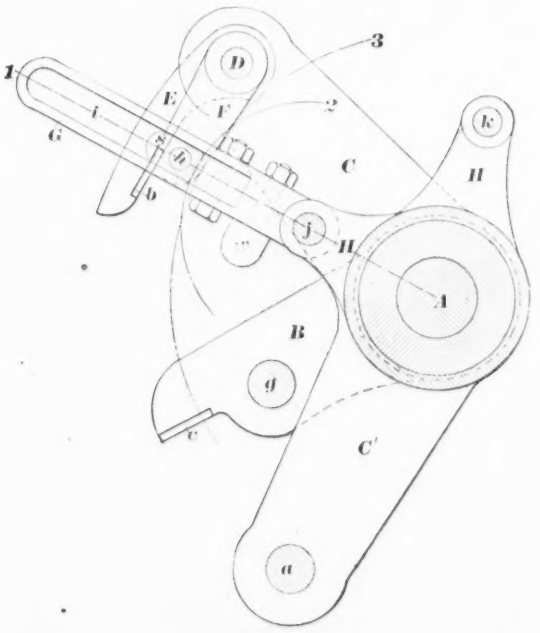


Fig. 4

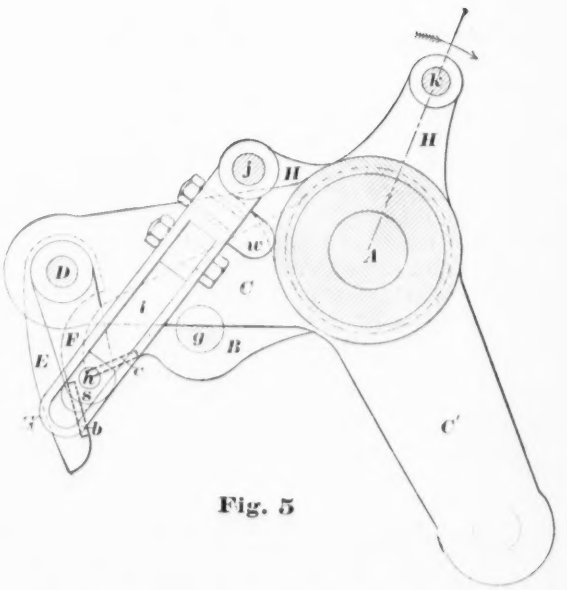


Fig. 5

pushed farther from the center of valve stem, and when the center line of link shall be coincident with radial line 1, as shown in Fig. 4, the block will have been pushed so far outward that it will have slightly turned the small rock-shaft *D*, and moved the hook *E* enough to release the valve-lever *B*. Then the dash-pot will act and close the valve.

At this moment of release, effected by the toggle-like action of the link, the pressure on the bell-crank *H*, caused by the liberation, will be exerted in a radial line from the center of the slot through point *j* to center of valve stem or the stand which supports it, and during the entire movement of the hook *E* there will be no appreciable strain to turn the bell-crank *H*, and consequently there will be no strain to disturb the normal action of the governor. As the position of the bell-crank *H* is controlled by the governor, any change in the height of the governor will cause a change in the position of the point *j*, and a corresponding change in the time of release.

The action of the automatic safety stop motion is illustrated by Figs. 3 and 5. Fig. 3 shows the position of the various parts when the engine is at its lowest normal speed, and the hook *E* is at the point of engagement with the valve-lever *B*. The lower side of the link *G* is provided with an adjustable embossment *w*, which, in the position shown, is just clear from the hub of bell-crank *H*. Now, should the governor belt be broken, or if from any other cause the governor balls should fall below this point, the bell crank *H* will be moved in the direction indicated by the arrow in Fig. 5, the embossment *w* will be brought against the hub of bell-crank, and the continued movement of the bell crank will cause the embossment to act as a fulcrum, and the lower side of slot *i* will cause the pin *h* in forked crank *F* to move outward, or from center of valve-stem *A*. This will carry the hook *E* outward so far that it will not engage with valve-lever *B*, and the valve will remain closed.

In connection with the above, a simple attachment is placed on the governor column, by means of which the action of the stop motion may be suspended or made operative at any time by the engineer, and when suspended the engine can be stopped and started in the usual way.

Figs. 6 and 7 show details of cylinder and valve gear.

The construction of the cross-head may be understood from an inspection of the engravings. The pin is of steel, and is located, as will be seen, in the center vertically, and very nearly so horizontally.

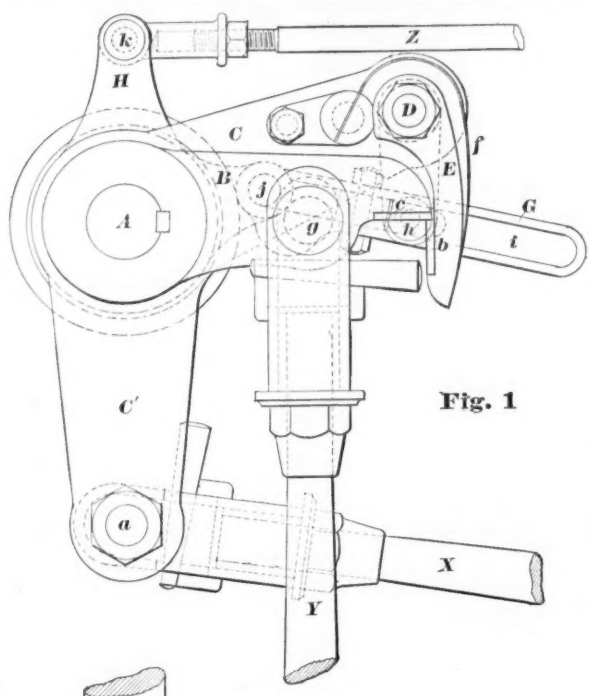


Fig. 1

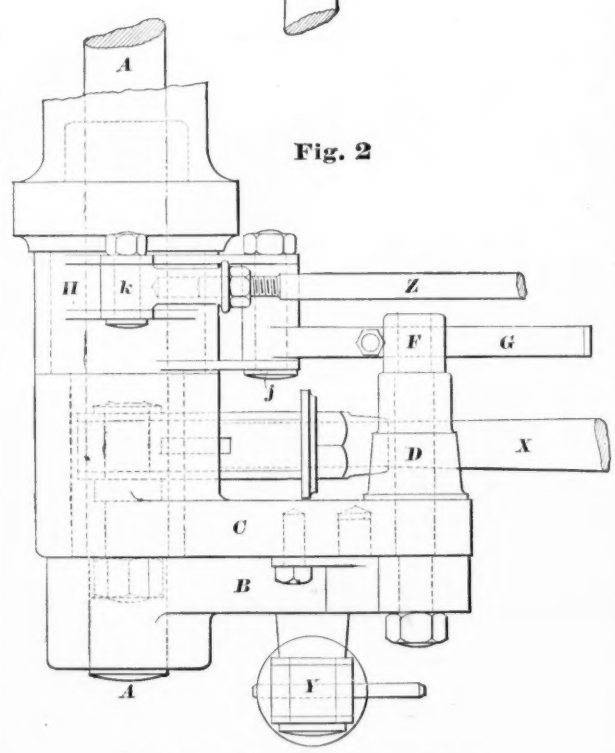


Fig. 2

Details of Improved Corliss Engine.

Practical Drawing.

By J. G. A. Meyer.

FIFTH PAPER.

DRAWING MATERIAL, DRAWING TOOLS AND HOW TO USE THEM.

71. Drawing paper. The paper that is best adapted for our purpose must have a tough surface, so that it will stand the rubber well, also on which perfect ink lines can be drawn, and take the color evenly when applied with the brush.

A great variety of drawing paper is manufactured from which we can select. We will mention some kinds of this paper, but it must not be understood that to which we draw attention is the only suitable paper. Whatman's drawing paper is often used, and is certainly very good. Of the different varieties of this paper we would recommend the "cold pressed" or "rough" as best adapted for our purpose. Hot pressed or smooth paper (Whatman's make) although very good for some purposes, we would not recommend for working drawings. Whatman's paper is made in sheets of various sizes, each size being known by one of the following names.

Cap	13″ x 27″
Demy	15″ x 20″
Medium	17″ x 22″
Royal	19″ x 24″
Super-royal	19″ x 27″
Elephant	23″ x 28″
Imperial	22″ x 30″
Columbia	23″ x 24″
Atlas	26″ x 24″
Double Elephant	27″ x 40″
Antiquarian	31″ x 53″

These papers have a water-mark of the maker's name, and the side on which the name reads correctly is called the right side, and upon this side the drawing should be made.

Another kind of paper is called the egg-shell paper; this is certainly an excellent paper. It is made in rolls, and can be bought in any desirable length. This paper has a rough and a smooth side; the rough side is best adapted for our purpose.

Other kinds of machine-made paper, either in rolls or in sheets, can be used, providing its surface will not be injured by the use of rubber and comparatively strong to withstand rough usage. If the lines are not to be drawn in ink a cheaper paper will be quite satisfactory. As for the most serviceable size of sheet for elementary practice we would recommend 19″x24″.

72. The next thing that will be required is something to which we can fasten our paper while we are drawing upon it; for this purpose we need the drawing board.

Drawing board, Figs. 33 and 34. This should be made of good seasoned pine free from all knots and straight-grained, the grain running lengthwise. The edges of the board must be square with each other. On the back of the drawing board two battens *a a* are fastened with the screws *b b*; these screws should pass through slots in the batten, as shown in Fig. 33; this will prevent the board from splitting. The battens serve to hold the board straight, and in order to gain the greatest stiffness the battens should be fastened edgewise to the board, as shown in accompanying figures.

Another mode of fastening the battens is to dovetail them into the board, see Figs. 35 and 36. This dovetail should be a little larger at one edge of the board than at the other, so that it can be driven tight similar to a wedge. These battens need no screws. Figs. 37 and 38 show another construction of a drawing board; this, although more expensive, we consider a far superior one, and strongly recommend it. Fig. 37 represents the face of the board and Fig. 38 its edge. The same kind of wood, and selected with the same care as recommended for the former board, will answer for this one. The peculiarity of construction is seen in Fig. 38, which indicates grooves about half the thickness of board in depth and about ¾ of an inch wide with a space of about ¾ of an inch between them. These grooves run the whole length of the board as seen in Fig. 37. The battens are fastened similar to those shown in Figs. 35 and 36, and have the same dimensions. This kind of board will not warp as easy as the solid one, and is comparatively light to handle.

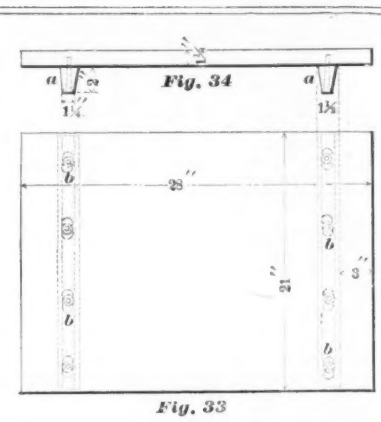


Fig. 34 Fig. 33

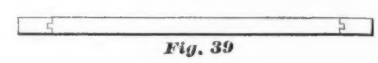


Fig. 39

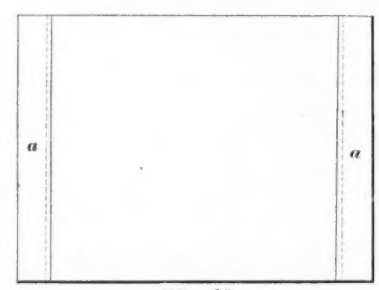


Fig. 40

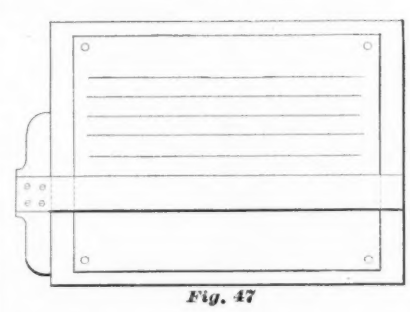


Fig. 47

The size of board that we would recommend to students is 28 inches long and 21 inches wide. All other dimensions for this size of board are plainly given in the accompanying figures.

We cannot conclude the subject of drawing boards without referring to the kind represented by Figs. 39 and 40. This in our opinion is the worst kind made. In this case the battens *a a* are fastened to the end of the board with the grain of these perpendicular to that of the board. The shrinkage of the wood being less lengthwise than crossways, it follows that in a short time the battens will project beyond the edges of the board, and this is a very objectionable and annoying feature. Neither will battens fastened in this manner hold the board as straight as those fastened to the back of the board, and as previously described.

73. For fastening the paper to the drawing board we use the thumb-tacks as is shown, full size, in Figs. 41 and 42. These tacks are made of steel pins screwed into brass or German silver heads. The cheaper kind of thumb-tacks have the pin driven into the head; we cannot advise the use of these, as the head is liable to slip over the pin when pressure is brought upon it, and since it is almost a universal practice to use the thumb for pressing the tacks into the board the sensation will be painful should the head slip while in the act of pressing upon it. Four thumb-tacks will be sufficient (one in each corner of the paper) to hold the size of sheet that we have recommended.

When some part of the paper is to be

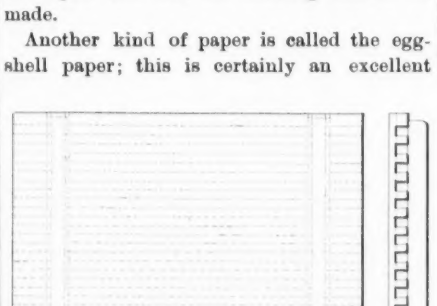


Fig. 37

Fig. 38

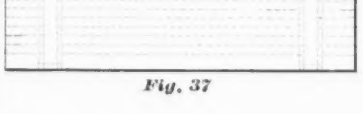


Fig. 35

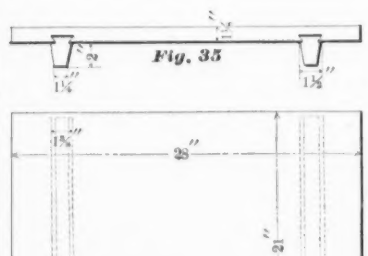


Fig. 36

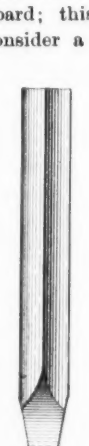


Fig. 43

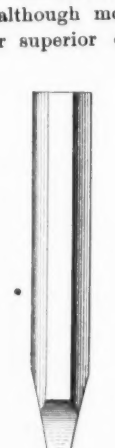


Fig. 44

Fig. 41

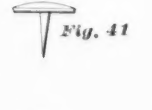


Fig. 42

Fig. 45

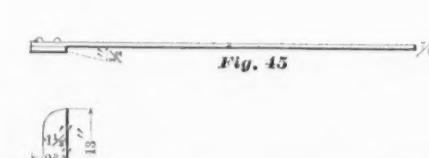


Fig. 46

tinted, it is always best to fasten the sheet to the board with mucilage, a process which will be fully explained when we commence the study of tinted surfaces.

74. In the construction of a working drawing it is customary, whenever practicable, to draw all horizontal lines lengthwise of the board, see Fig. 47. By following this custom the student will avoid an unnecessary strain upon his body, because he will have to bend over a smaller distance.

75. All lines are first drawn with a pencil. Pencils of a poor quality should not be used, as hard spots are often found in them, hard enough to scratch the paper, thus giving considerable trouble and annoyance; we therefore recommend only the use of the best quality of pencils.

These are made of different degrees of hardness, having the degree of hardness stamped upon one end of the pencil. Thus *H* stands for hard, *H H* a degree harder, *H H H* still harder, and so on up to *H H H H H H H*. In our experience we have found *H H H H* pencils (commonly called "four *H*" pencils) to give very good satisfaction, these being sufficiently hard to retain a good point, and lines drawn with this pencil can be easily erased when necessary.

Pencils should always be sharpened at the end opposite the one on which the degree of hardness is stamped, so that if different kinds are used their degree of hardness can be easily distinguished.

The proper mode of sharpening a pencil is to sharpen it to an edge, as shown in Figs. 43 and 44. If sharpened to a round point the lines made with it will soon become too broad for accurate drawing. Pencils may be conveniently sharpened by first removing the wood with a sharp knife, and then reducing the lead to an edge by rubbing the opposite sides of the lead on fine emery cloth or a fine file.

76. The outside form of a pencil is either made round or of a hexagon shape. For practical drawing we would strongly recommend a pencil having a hexagon form (6-sided). Our reason for recommending the hexagon pencil is that it will not roll off the board as easily as a round pencil; and since the upper edge of a drawing board is generally placed a little higher than the edge nearest to the draftsman, a round pencil is almost certain to roll off whenever placed upon the board, and when this occurs (for some unexplainable reason) the point of the pencil, in nine cases out of 10, will be broken, which is not very conducive to the good nature of a draftsman.

77. To draw a line hold the pencil perpendicular or very nearly so to the surface of the paper with the broad side of the pencil point against the edge of the square. Always draw all horizontal lines from the left to the right hand, and vertical lines from the bottom to the top of the board, and oblique lines from the left to the right hand.

We have already stated in article 74 that it is customary whenever practicable to draw all horizontal lines lengthwise of the board. All such lines must be drawn with the aid of a T square.

78. T square, Figs. 45 and 46, *a* is called the blade and *b* the head. The blade should be made of hard wood; plain maple, straight-grained, gives good satisfaction, although any other close-grained hard wood, not liable to warp, will answer the purpose. It is always best to make the length of the blade, that is from the head to end of blade, the same length of drawing board. In this case it will be 28 inches long, and for this length $2\frac{3}{4}$ inches will be a good width. For longer blades the width may be increased; $\frac{7}{64}$ of an inch is about the proper thickness. The blade should be fastened to the face of the head with four or five screws, as seen in Figs. 45 and 46. Sinking the blade flush with the face of the head is not recommended, as this will prevent the sliding of the set squares beyond the edge of the drawing board; this will be better understood as we advance with our drawing lessons. The head is generally made of black walnut; its shape and dimensions are indicated in the accompanying figure. The blade should be square with the head.

79. The proper manner of using the T square is to slide the head of the T square along the left hand edge of the board to any desired position, Fig. 47, then hold the head firmly against the left edge of the board and draw the line along the upper or front edge *c d* of the blade. All lines that have been drawn in this manner must be parallel, see Fig 47; if not, either the head of the square or the edge of the drawing board is not straight, which must be immediately rectified.

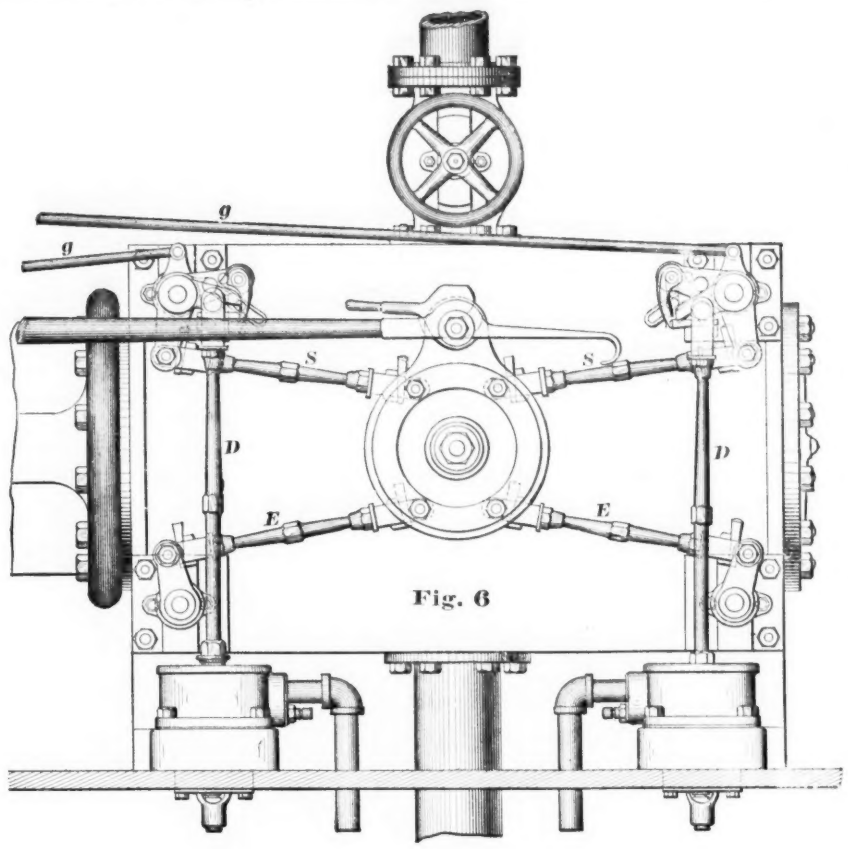


Fig. 6

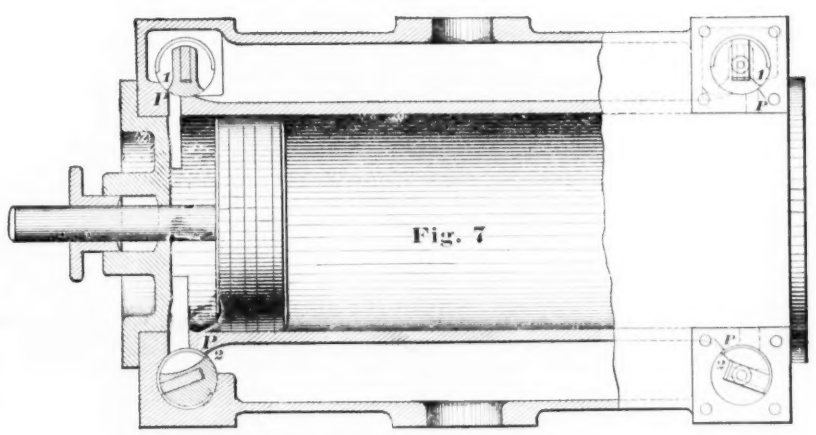
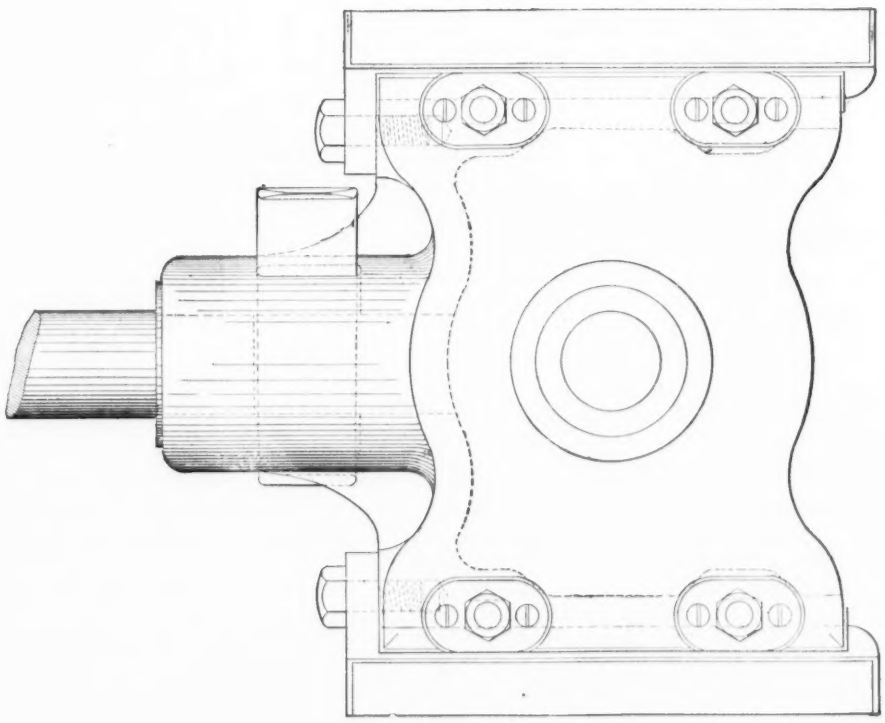


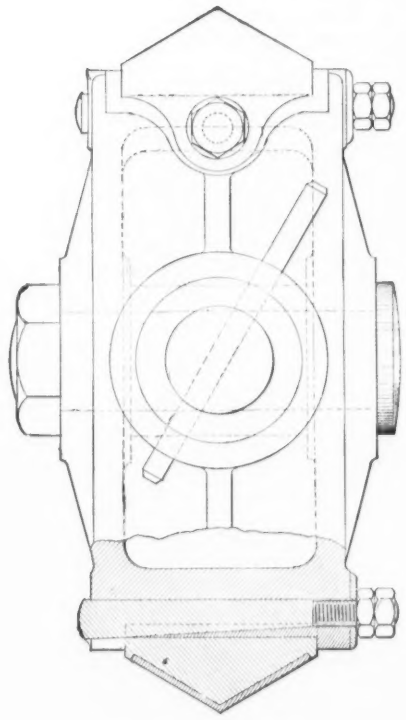
Fig. 7

Details of Improved Corliss Engine.—*See page* 1.

CROSS-HEAD



ELEVATION



END VIEW

The shipbuilding trade on the Clyde is improving. Although several yards are entirely at a standstill, it is encouraging to know that new shipbuilding orders have been received, and that the winter of 1886-87 is not likely to be so bad as was expected.

An Iowa man has patented a stock-waterer. He could probably get valuable points on Wall street in relation to watering stock. It isn't necessary to use a trough, or its equivalent, which the Iowa inventor seems to think essential.

The Edinburgh International Exhibition covers an area of 7 acres, cost 30,000*l.*, and was built in six months.

Closing an Old Establishment.

The closing of the works of the Abbott Iron Company, at Baltimore, shows the force of the competition of improved methods in iron working, and the uselessness of trying to work old machinery and old methods against improved machinery and methods. This was formerly a prosperous business concern, and one of excellent reputation as regards the quality of work done. The works were established in 1828 by Peter Cooper, and grew into one of the large establishments of the kind, the present plant covering about ten acres of ground. While cheaper fuel elsewhere has something to do with the determination to discontinue the business, the principal reason appears to be a gradual loss of comparative efficiency through failure to adopt modern machinery and appliances. The reason why this has not been done is probably largely due to the lack of a single competent head, the business having for a long time been managed by a board of trustees. In one sense it is a misfortune that such a business should be discontinued, but it does not necessarily mean that less business of the kind shall be done in the country.

The Boston *Commercial Bulletin* very aptly says: "If the adoption of free-trade will permit us to more successfully compete with Great Britain for the markets of the world, why, in the name of common sense and British shrewdness, is she so anxious to have us try it!"

Machine Tools for Patternmakers.

BY F. W. BARROWS.

Dovetails may be cut on an ordinary saw table if it is in good shape. Fig. 66 shows how the kind of dovetail so much used for small packing boxes, and sometimes called Canada dovetails, may be made; *a b* is the saw table, *c* the saw and *d* the gauge piece. This piece is made of a parallel thickness, and before fastening to table has a slot sawn through it, and a strip of hard-wood *e*, which just fills the kerf, is placed in it. This piece *d* must be fastened on the saw table in such a position that the hard-wood strip *e* will be parallel with the saw, and distant from it exactly the width of cut made by saw; then the pieces left standing between the cuts will just fill the cuts on the piece used for the other half of joint. You will see that the only difficult part of the job is setting the piece *d* so that the tenon left between two cuts will be of the same width or thickness as saw kerf. Do it this way: Saw the slot in *d* for the strip *e*, fit two hard-wood strips into it, letting them project above the surface of *d* $\frac{1}{4}''$ or $\frac{3}{8}''$, and also saw a slot in another piece of stuff before moving either saw or fence. You now have two pieces with a groove in each one at the same distance from one edge, the edge which was placed against the fence. In one of these pieces put one of the hard-wood strips, then use the other as a gauge piece between the first one and the saw, so that it will leave exactly the same thickness between the cuts that it cuts out. After finding the width necessary, lower the saw beneath the surface of table, and place the piece *d* in position against the fence. Then start the saw and raise it up slowly, letting it cut through *d*. Set it to the right height, then, after moving the fence out of the way, you are ready to go on with your job.

It will be found best to fasten a number of pieces together for sawing, as this will give more length to the surface in contact with the fence or strips *e*, and thus hold the stuff steady while passing over the saw.

For sawing a regular dovetail you must make the piece *d* with the surface inclined to give the bevel necessary for dove-tail as shown at *d*, Fig. 67. The hard-wood strip *e* must be fixed parallel with the saw, then you may take choice between two ways of gauging or spacing the dovetails. You may cut them all from one edge of the stuff by sawing one side of all the dovetails, and then by turning the gauge piece *d* around to the position shown by dotted lines *f* and *g*, Fig. 67, being particular to place *e* at exactly the same distance from saw that it was when the first side of dovetails was cut. Then after locating the first cut from the same edge that was used in locating the opposite side of dovetails you may finish cutting them. There is a difficulty about this which will be explained farther on, and is caused by moving the gauge strip *e* when the piece *d* is changed to the opposite side of saw.

A better way is to get spur pieces out all of the same width. This may be done by the saw. Then locate the first cut on either side of dovetail by the two edges of piece, and the strip or guide *e* will do all of the rest, and won't have to be moved for the second side. If it is desired to make the first nearer the edge, than the distance between *e* and the saw, use a parallel piece between the stuff and *e*.

The other part of the joint, the gain or mortise, will have to be cut one piece at a time. If your saw table has an adjustable slide for sawing horizontal angles, this may be accomplished very easily. Fasten to the slide a piece of stuff like section shown at Fig. 70, making *a* the upright portion high enough to give a good support to the stuff to be sawed, and the rabbet at *b* about the same thickness as stuff to be cut. This piece should be in length about twice the width of the pieces to be dovetailed, once the width on each side of saw, to support them as they are moved from one side towards the other. This piece is also shown at *d*, Fig. 68. The first cut on each side of dovetail will be gauged from the edge of stuff. This can be done by putting a hand-screw on the slide at the required distance from saw. The position of this cut will locate all of the others by means of the strip *e*. The cut which holds this strip is made before fastening the piece *d* to the slide, which will insure its being parallel with the saw.

We can now saw one side of all the gains, then by turning the slide around to the opposite angle, and making another cut for *e* parallel with the saw in its present position, we can finish the gains.

If the saw table has no adjustable slide, make a slide as shown in Fig. 69, where *a* is the fence, *b c* the slide or gauge, and *d* the saw. The two sides of the gauge *b* and *c* should have a section like Fig. 70, and should be far enough apart at the saw to give some length outside of saw to support the stuff being cut, and the distance between the saw and fence must be equal to the whole width of pieces to be dovetailed, as the fence is not to be moved while sawing the gains.

At *e e* are shown the hard-wood slips which determine the space between cuts. The saw kerfs for holding these slips are made by setting the fence one space nearer the saw, before locating it for cutting the gains. There is one thing which is very important, the accurate spacing of the cuts at the two angles necessary to form the two sides of gains, and which is accomplished very easily and correctly by this means. It is evident that if the spaces between the cuts for one side of the gains are longer or shorter than the spaces for the opposite side, the width of the gains will increase or diminish in the same proportion. This is a point about which great care should be taken, as it will be almost impossible to make the dovetails fit together if they are not of the same size, and spaced evenly. This will, of course apply to both the dovetails and the gains, or the tenons and mortises. The test of spacing the dovetails is to get your stuff to a width, then the same gauge does for both sides of the tenons without moving, and for cutting the gains. The method shown in Fig 69 will give the best results, because the cuts for the pieces *e e* are made parallel with the saw and both at one time, then as the angles formed by the two sides *b* and *c* of the sliding gauge are equal, it follows that the distance between the saw and either one of the pieces *e* will always equal the distance between the saw and the other piece.

This manner of cutting dovetails may be used for making snap-flasks, or for any other purpose where a good many pieces are to be made all alike. It would not pay for only a few.

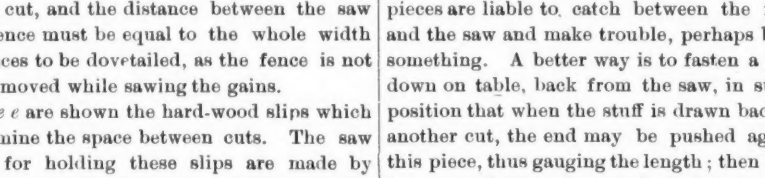


Fig. 67

Fig. 66

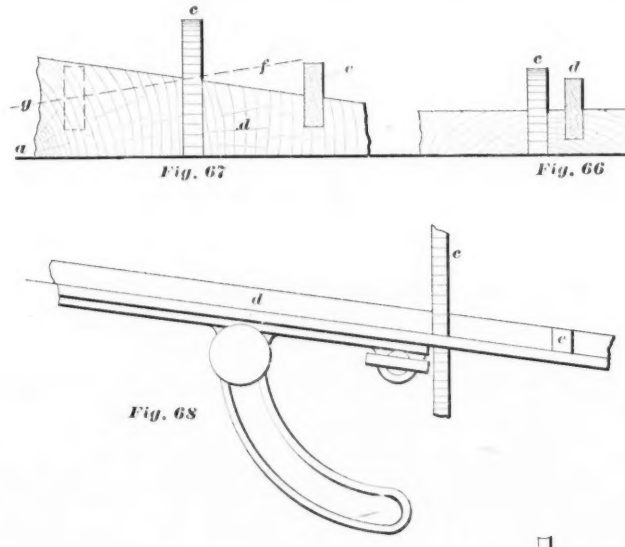


Fig. 68

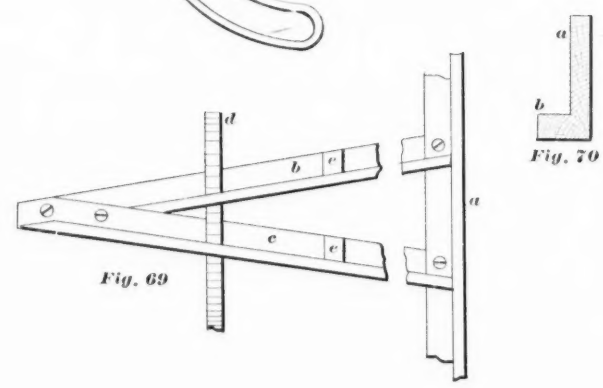


Fig. 69

Fig. 70

In sawing miters (horizontal), as for picture frames, it is evident that unless the opposite sides are of the same length, that the joints won't fit; to get them of the same length place one on top of the other and cut them both at once.

By using a gauge piece similar to the one used in cutting staves, shown in Fig. 63, any number of pieces may be cut at once, as in making hexagonal or octagonal frames. This may also be done by putting a stop or slide after cutting one end of all the pieces to be sawed to the same length, and placing the cut end against the stop.

In sawing pieces off square and of the same length, where they are to be cut pretty short, as in cutting up stuff for gear teeth, one very common way of gauging the length is by the fence; but if the stuff sawed is narrow, the pieces are liable to catch between the fence and the saw and make trouble, perhaps break something. A better way is to fasten a piece down on table, back from the saw, in such a position that when the stuff is drawn back for another cut, the end may be pushed against this piece, thus gauging the length; then when it is moved up to the saw it is left all clear. This may also be accomplished by a piece placed against the fence and kept back from the saw. If you still persist in using the fence alone for a gauge, just count your fingers after you have done sawing, to be sure that you still have the right number.

Success of a Model Trade Union.

The Brotherhood of Locomotive Firemen recently held a large and enthusiastic convention in Minneapolis. In his annual address Grand Master F. P. Sargent said:

When we contemplate the rapid growth of our Brotherhood, how in thirteen years it has grown in numbers from 11 to 17,000 members, we cannot help but admire the work of the men who only a few years ago were looked upon as being devoid of principle and unworthy the association of respectable people. Organizing themselves together for the purpose of advancement, selecting for their watchwords, "Benevolence, Sobriety and Industry," living true to every obligation, faithful in the discharge of every duty, they saw their efforts crowned with success, and to day wherever the locomotive proclaims the advance of civilization, you find the locomotive fireman an honored and respected member of society. To be a locomotive fireman and a member of the Brotherhood is to be regarded as the peer of all men. Benevolence being one of the teachings of the Brotherhood, and being brought into daily use in our calling, our members are constantly impressed with the necessity of being prompt in meeting all financial obligations, so that the order can at all times discharge its liabilities to its members. During the few years that our order has been in existence there have been paid out for the benefit of members and their families over three-quarters of a million dollars. This money has gone out to relieve the wants of those who would have been left to the cold charity of the world had it not been for the benevolent work of our Brotherhood. Again, this Brotherhood teaches its members sobriety. Realizing how essential it is that locomotives should be manned with sober men, the Brotherhood has placed in its platform this plank, and when a candidate enters our order the great principle of sobriety is taught him in such a manner as to leave a lasting impression upon his mind. We believe that sobriety is one of our safeguards; that to leave out that principle of our order would prove detrimental to the interests of all classes of society, and as one of our objects is to better the condition of all railroad men by good example, we continue to urge upon our members the necessity of being sober men. Do you ever think what serious results would come to the public if the enginemen in whose hands is placed the keeping of the locomotives of our land, that draw the thousands of cars, freighted with human lives, were men of intemperate habits—were not able to control themselves, but with brain crazed with drink would rush on regardless of orders or signals, causing certain destruction to all who were so unfortunate as be placed in their keeping? The Brotherhood realizing the result of such men manning our locomotives, inculcates this virtue of sobriety into the mind of every member, and by rigid laws seeks to keep only sober men in its ranks. * * *

Railroad building in this country is by no means completed. The principal roads are continually making improvements in the roadbed and equipment, by which distance is shortened, speed increased and the safety of passengers promoted. New lines are being constructed, and engineers and firemen are in constant demand. With our teachings of sobriety and industry, and the good influence brought to bear upon the members of our order, we cannot but feel that the class of firemen we would supply would be such as the traveling public would prefer to have in such responsible positions, while railway officials would recognize in a member of our Brotherhood a faithful employe, always at his post, and not afraid to do his duty. Courage is one of the requisites that go to make up a good engineman. A man to ride upon a locomotive must be a man of nerve—one that can face danger in all its trials, and in the hour of disaster retain his presence of mind. The Brotherhood teaches this, and the man who has not the moral courage to face danger, should never apply for membership in our order. Day by day we read of accidents upon the rail where enginemen lose their lives in the discharge of their duty. Did you ever consider the position of an engineman when dashing along at a speed of forty miles an hour? He sees the misplaced switch, with the siding filled with cars heavily loaded, and knowing that there is no power to prevent him from colliding with this terrific force, when with only one thought, and that to do his duty, he goes down to death. Do you not think, kind friends, that it requires men of nerve to fill the positions that these bronzed veterans fill, and do you ever consider, in the face of all these dangers, that in many cases they are the most poorly paid of any class of workingmen in our land? And yet, such is the fact in many sections of our country. It is one of the purposes of our organization to secure reasonable wages for the enginemen of this country, believing that when men risk their lives day by day, in sunshine and storm, in daylight and darkness, they should have a fair day's pay for a fair day's work, and that is what many locomotive enginemen are not getting to-day.

We are a labor organization, you would say.

I will answer, yes. Knowing that only by organized effort we can protect ourselves, we have adopted certain methods whereby we can obtain justice at the hands of our employers.

There are sometimes men so selfish and narrow-minded that they consider that a laboring man has no rights—that he is simply a slave in the service of his master, and, unfortunately, there used to be some of that kind of men who got to be railroad presidents and managers, and they could never enjoy a good night's sleep unless they were getting all the receipts of the road, while the poor enginemen were compelled to work eighteen hours out of twenty-four for a mere pittance. The Brotherhoods have wrought a change. Those old fossils have nearly all gone to the rear, and more liberal, broad-gauged men have taken their places, and the railway presidents and managers of to-day are more disposed to give their employes fair wages. * * *

Our system of adjusting grievances is by arbitration, believing this is the only sure method of preserving harmony between employer and employe. If at any time we feel aggrieved, we make a statement of our grievance and place it in the hands of the Grievance Committee of the local lodge. The chairman of this committee, through its secretary, calls the committee together and examines into the merits of the grievance, and if considered just, the committee so reports to the lodge with proper recommendations, and if the lodge considers the grievance worthy of action, it orders the committee to proceed to adjust the matter. The committee then call on the Master Mechanic and Superintendent, and in a gentlemanly manner lay the grievance before them, and if possible arrive at a satisfactory settlement. If the Master Mechanic and Superintendent have not the power or show no disposition to treat with the committee, they go to the General Manager, from him to the President, and so on until all means have been exhausted to secure a settlement. If they fail, they then send for their chief executive, and on his arrival he, in conjunction with the committee, again uses all means within reason to effect a settlement. Failing again, it then lies in the power of the Grand Master to order the men to quit work, or, in more plain terms, to strike. Now the Brotherhood of Locomotive Firemen have been in existence nearly thirteen years, and during that time we have not been involved in a single strike. We believe that the conservative stand that has always been taken, and the intelligence of the men that have been our leaders and committees, have been the means of making this record.

Moulding Pulleys.

By Robert E. Masters.

A correspondent writes me, "In American Machinist, October 23rd, 1886, in an article on moulding pulleys, you speak of lifting plate, ring pattern, etc. I have been running a little shop away out West here for a long time, and the above named journal, which I receive regularly, is all I have to keep me up with the times. I would be very glad to have you give a description of patterns, lifting plates, etc., for moulding pulleys under 3 feet diameter. My pulley patterns are all in halves, and I have three or four of each diameter different widths of face. Perhaps I ought to be ashamed of being so much out of date, but I am a machinist by trade, and all I know about foundry work I picked up since I have been running this little repair shop."

There is nothing whatever to be ashamed of, for it is not unusual to come across men who have served time as moulders and who do not understand making a pulley of this description. Some of them are very good workmen, and it is simply because they never worked where they made this class of work; a little explanation always makes the matter clear to them.

In this issue we illustrate a way of making a ring or band pattern for the pulley rim. In the first place, step *A* is cast large enough so that when it is bored out tapering and the end of the shaft *B* turned to a snug fit it will hold the shaft rigid without any other support. For sweeping up small ring patterns, etc., a shaft 1½″ diameter, 2′ 6″ or 3′ long is plenty large enough. For a larger class of work use a shaft 2″ diameter and long enough so that the upper end can be fastened in a box on the end of a swinging arm which is fitted to the wall, said box to be adjustable so that it can be moved to plumb the shaft.

Have two set collars and two cast or wrought iron arms *C* with slots in the arms to bolt the wooden strikes fast. For striking up small work it is not necessary to have the strike any higher than the line *D*, having a set collar on each side of the lower arm, but for larger work it is best to have the strikes as shown, as they are firmer and will not spring away from the work.

Fig. 2 is a plan view of the arm and strike. It will be noticed that the sweep revolves and the shaft remains stationary. Another plan in green sand work is to fasten the arms with a key or set screw, and have the shaft revolve with the sweep. On the other hand in striking up some classes of loam work the strike remains stationary and the mould revolves.

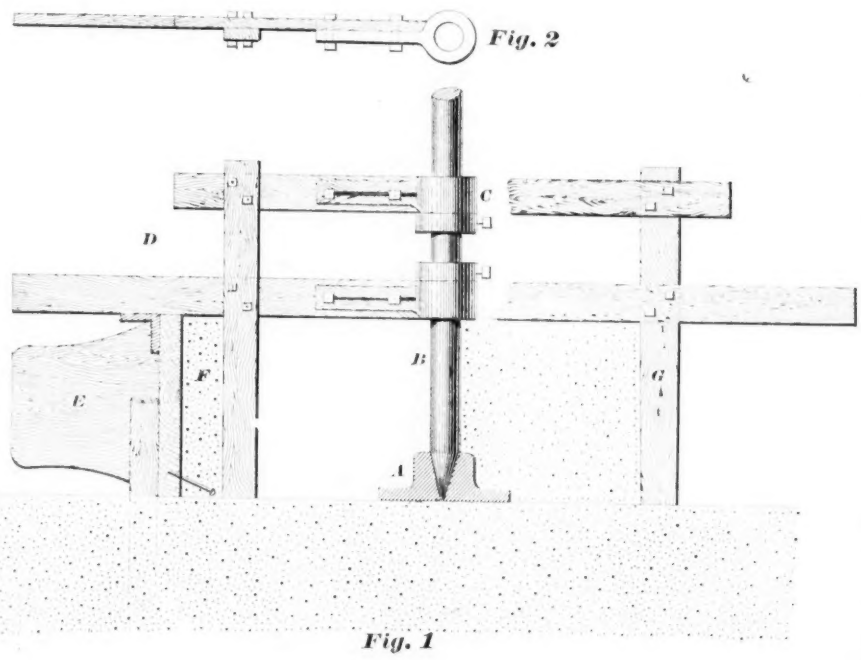


Fig. 1

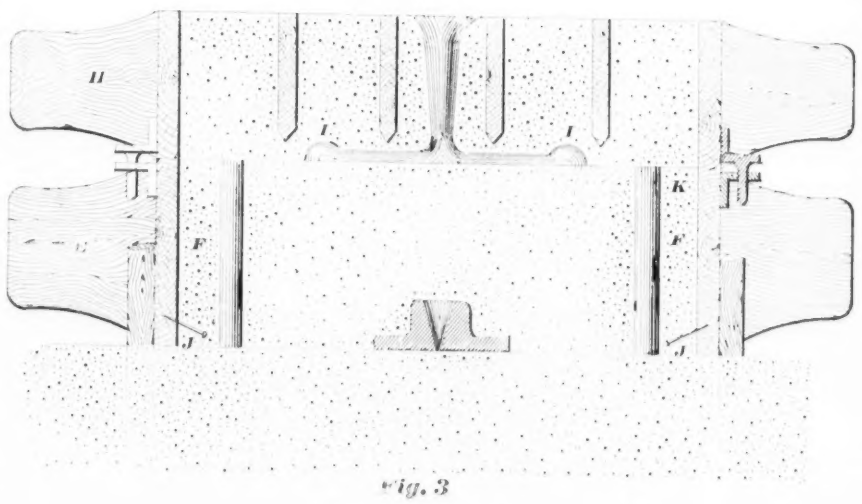


Fig. 3

Moulding Pulleys.

In case the shaft revolves with the sweep, instead of boring the step-out tapering, a steel point is fitted in it and one end of the shaft is countersunk to fit the point. Of course in this style of spindle and step the upper end is always fitted in a box.

Put the flask (or drag) *E* down on the bed dividing the space equally by using the shaft (which has been plumbed) as a center, build up the sand at *F* and strike off until the circle has been completed. After finishing smooth and firm lift out the spindle and strike, then lift the flask off and set it aside; now return spindle and strike to sweep up the inside shown on the right hand side, Fig. 1. The rim can be made heavy or light by moving the upright strike *G*. After the inside or core has been struck up take off the strikes, lift the spindle out and fill the hole up with sand.

Before setting the drag *E* back on again feel all over the surface of the mould to see if there are any soft spots; if there are, don't press them in with your hand until you have a hard surface, or commence filling up with a trowel slicking sand on top of slicked sand. This is a common practice with some moulders, and causes more loss from scabbing than any other one thing that I know of, especially in overhead patching: rather rough the place up with a trowel, take some sand and fill up a little above the surface of the mould, then take the trowel and dress it down, making the surface about as hard and smooth as the balance of the mould. It is a good idea to rub the fingers lightly over a patched place, then blow it off with a bellows; in some sand and thin castings this often prevents a blister. Now put the drag *E* back on again.

The cope *H*, Fig. 3, is laid upside down on the floor or a board, and rammed up with a pouring gate in the center. Strike off level with a straight edge, slick down and shake on plenty of parting sand, turn it over and close it on, then lift it off again to see if it touches all around; or, if you have a "crush," also cut the gates. In cutting the gates cut a good channel in a circle in the cope at *I I*, then cut four channels from that to the sprue in the center; between these and the drag cut light gates to the mould. These gates must not be so heavy where it discharges into the mould, but what the channel *I I* can be kept full when pouring it.

Another plan for making the core or inside of the pulley which may seem easier, is, after striking up the outside have strips of wood the right length and thickness, and stand them up against the sand all around at *F F* Fig. 3, and ram up the inside, then put the cope on the drag and ram it up and lift off the same as in any mould. Draw out the strips, lift off the "cheek" or drag *E* and dress up the mould. *J J* are spikes driven in the flask to support the sand when it is lifted off.

These pulley bands are usually made from 6″ to 8″ deep. Of course in making the measurements for any certain sized pulley you will have to allow for two shrinkages, one in casting the band pattern and one in casting pulleys from the band.

After the band is cast turn it up inside and out perfectly straight (some prefer giving a little taper) bore three or four ⅜″ or ½″ holes, depending on the size of the band, ½″ from the edge through at *K* and equal spaces apart, then make some hand hooks to draw it up and lift it out by.

A number of ideas have been suggested in this article so that it would not be necessary to be confined to any one plan. In my next will be shown how to make the lifting plate and mould a pulley.

B. F. Kelley has an article discussing ancient signatures in the October number of the *Penman's Art Journal*. He says:

"The sign of the cross, used by persons who could not write, is said to have originated during the Crusades, and was originally made with the blood of the signer. It was subsequently used with the signature to further attest to its sacredness.

"Among the many kings and emperors who could not write a signature, it is said that Theodoric, king of the Ostrogoths, was so illiterate and stupid that during the ten years of his reign he was not able to write four letters. The letters were cut for him in a plate of gold, and the plate being laid on paper, he then traced out the letters with a quill."

LETTERS FROM PRACTICAL MEN.

Turning Tapers.

Editor American Machinist:

Seeing your answer to C. H. B. in Oct. 30th issue, reminds me of a way of boring tapered holes that I first saw used when an apprentice.

First, turn an arbor say 8′ to 12″ long, with good sized centers. Then fit lathe chuck on one end. As near to the chuck as will let it work when set over to the desired taper, turn a place for the steady rest, with a shoulder that will not let the arbor work off the line center, when the other end is free. Then set the lathe over (with the arbor between the centers), enough to turn the desired amount of taper to the foot. Put on the steady rest so that it will hold the arbor up to the live center. Move back the tail stock, put on the chuck and the rig is ready for business. Be careful to set your boring tool the same height as the lathe center. This rig may not do very well on very tapered work, but will be found a very handy tool to have around.

Eccentric Strap.

Wahoo, Nebraska.

Making Cloth Stick to Iron.

Editor American Machinist:

In answer to your correspondent who wants a cement to fasten cloth to cast iron rollers, I will give my receipt. Take equal parts of white lead, red lead and cast iron borings. Mix with lard oil until thick enough to saturate the cloth. Spread about $\frac{1}{16}$ of an inch thick on rollers and lay on the cloth. Have a sheet iron band the length of the rollers with bolts, put on and screw up tightly; third, put in a warm place until hard and dry. Remove the cast iron band, and your cloth will adhere tightly.

A. J. Kables,
158 Myrtle Avenue.

Buffalo, N. Y.

Unequal Wear Caused by Want of Balance.

Editor American Machinist:

Flat spots on crank pins, such as Mr. Geo. Osborne mentions in October 30th issue, are quite common whenever the rotating parts are unbalanced and the speed is high. Gear wheels will work in the same way—wear the teeth from one side more than on the other side of the wheel—making a flat spot as it

were—notably the pinions on mill spindles in flouring mills.

The old fashioned sun-mill crank was my first lesson in this matter, and the curiosity about it was that the spot would be just where it would seem as if the wear ought to be least. I was told that such a spot was evidence of a smart mill. I now see that it was want of balance, and that the thrust on an unbalanced journal is on the light side.

F. J. MASTEN.

Belmont, N. Y.

Fastening Cloth to Cast-Iron Rollers.

Editor American Machinist:

In reply to the question addressed to your readers in regard to fastening cloth to cast-iron rollers, I will say that I have worked in a shop where steam power looms were built for weaving wire cloth. The back rollers were covered with leather, and this is the way it was done: Gear your lathe for a fine thread, say No. 16; make a screw tool with point rounded off, and take a cut deep enough to raise a good rough thread. When the roller is all cut across with a thread in this way, tap out a hole near the end, say $\frac{1}{4}''$; then, if the roll is hollow, place hot irons inside to warm it; if not, heat up a tank of water and place the roller in it until it is quite warm. It does it no harm, as the iron dries very quick after being removed, and leaves a little rust, which is all the better for glue. Next place it in the lathe, cut one end of belting off diagonally, and put in a screw to hold that end from starting. Put a tension on the belt by running it through two or three pins. Feed it on like a screw after putting on lots of glue. It will be very tight, and the other end can be fastened in the same way. After it is cold, it can be turned off. It lasts a long while, and stands a great strain and pressure. The trouble with our fellow-reader is, I think, due to his roller being smooth. Use good glue, put on in a long strip, very tight, and fasten the ends, and I think he will work it. The belting used was $2\frac{1}{2}''$, and rolls $6''$ x $5'$. STAR.

Bushing Loose Pulleys.

Editor American Machinist:

I have found the following plan for bushing loose pulleys that are worn from $\frac{1}{16}$ inch to $\frac{1}{4}$ inch to answer the purpose very well: Take a piece of sheet iron the thickness of which is a little less than one-half the slack in the pulley hole. Cut it a little less than the length of the hole in the pulley, and long enough to make a complete bush. Punch oil holes in this sheet, a dozen or so, before bending it, then bend it into shape on a mandrel. By moving the pulley along on the shaft this bushing can be sprung over the shaft and forced into the pulley with but little delay.

MATT DONNOVAN.

Accuracy of Leading Screws.

Editor American Machinist:

In your last issue there was an article relating to a screw and index plate made for the Niles Tool Works by the Pratt & Whitney Company, which may to some appear a little overdrawn (egotistical?) especially in the matter of the screw. It would be better to say (and this is what was intended) that the screw in question is, so far as we know, nearer perfection than any long screw in this country. We do not say, and do not think it is equal to many screws used for fine graduating and for other scientific purposes. Our experience has not been in this direction, but altogether in screws for lathes and other machine tools, and our acquaintance with this class of screws made by other parties leads us to believe that ours will not suffer by comparison with any other maker's. Our leading screw was perfected in our own shop, after having discarded other makers', because of their imperfections. We think it sufficiently accurate for our use in the manufacture of machine tools, but not accurate enough for many other uses. We might possibly improve it, but do not care to undertake it.

F. A. PRATT.

Hartford, Conn.

Many or Few Parts in a Machine—Odd Screw Threads.

Editor American Machinist:

In your issue of November 6 you comment upon the growing tendency in machine designing, to cheapen construction by casting journal boxes and like parts of one piece with the frame of a machine, rather than attach the same as separate pieces by means of bolts or screws.

Within certain limits this practice is in accordance with the best principles of machine construction, but when carried beyond those limits is the source of much future expense and annoyance. Journal boxes which are subject to much wear, and which will require occasional rebabbitting or bushing, should never be made solid with the main frame casting of a machine unless in places so easily accessible that the work may be readily performed with ordinary tools, and without taking to pieces the whole machine. When it is desirable to use solid bearings for small shafts or rods, the plan of forming them by means of sleeves or bushings inserted into the frame castings is a good one.

The sleeves may be made of bronze or any other suitable material, and when worn can be replaced cheaply by any repair shop. This, of course, adds somewhat to the expense of construction, but I think when its advantages are pointed out to the purchaser he will not object to paying for them. Another annoyance to which the "one piece" machine often subjects the machinist who has to repair it, and which causes him to condemn the designer to all sorts of unpleasant places, is that it is sometimes found necessary to dismantle a whole machine in order to take out a gear or pinion that needs a new tooth. The cost of doing this often forms the larger portion of the repair bill.

The practice which some manufacturers still adhere to of using bolts and screws of odd sizes and threads, should also be condemned, for it often subjects the users of their machinery to much loss of money and time. The theory that by this practice a manufacturer can control the repairs of his machines is not tenable, for if Jno. Jones & Co. of Cincinnati, Chicago or St. Louis, have a break-down anong some of their special machines, they certainly will not wait repairs until they can get bolts or screws from the maker at New York, but will have them made and fitted at the nearest shop, whereas if the bolts had been standard they would have been found in the regular shop stock.

F. A. HETHERINGTON,
Supt. Brooklyn Factory,
Campbell Printing Press and Mfg. Co.

Modern Locomotive Construction.

BY J. G. A. MEYER.

TWENTY-NINTH PAPER.

In our last paper we have seen that the lead of the valve remains constant when a stationary link is employed.

But now let us examine the state of affairs when a shifting link is used; by so doing we will find that the lead of the valve increases when the link is moved from full-gear towards mid-gear.

Fig. 168 represents a valve-gear with a shifting link, and here again, for the sake of simplicity, its mechanism is represented by center lines. Also, in order to enable us to

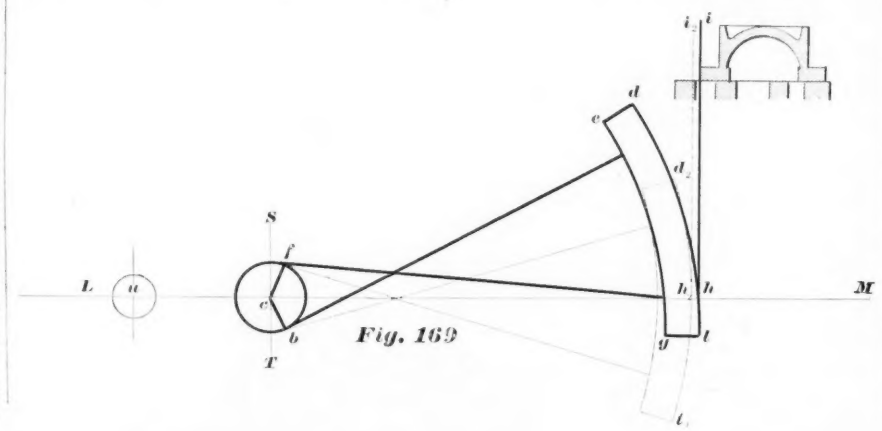


Fig. 169

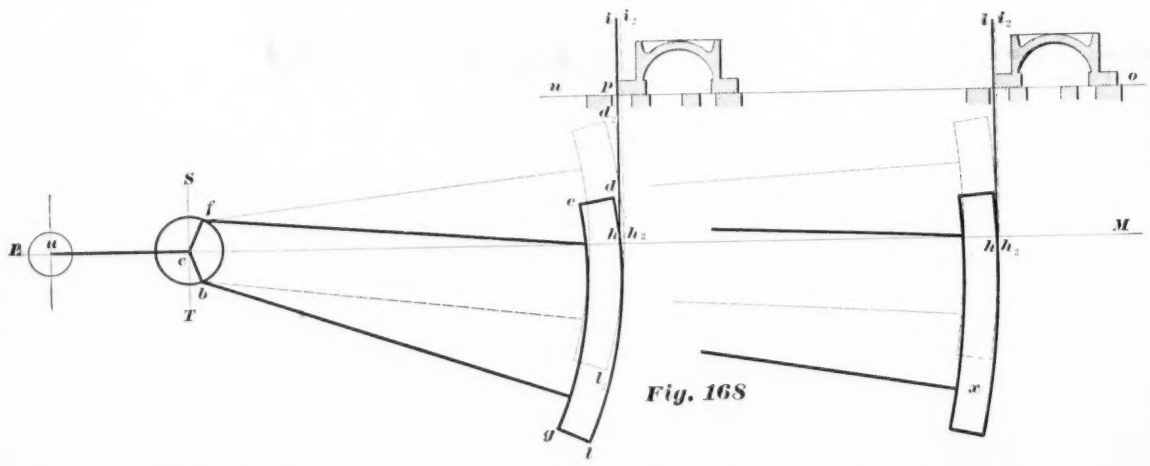


Fig. 168

if we know the position of the former, we also know the position of the latter. If, therefore, through the point h, a straight line, $h\ i$ is drawn perpendicular to $L\ M$, and the valve seat placed in such a position in which the distance between the line $h\ i$, and the outer edge p of the port, will represent the lead when the link motion is in full-gear, then we can easily determine the amount of lead when the link is set to cut off at any other portion of the stroke. Thus for instance: Let the arc $d\ h$ represent the position of the link arc when the link motion is in full gear and the piston at the beginning of the back stroke, and also assume that the valve has $\frac{1}{16}$ of an inch lead when the link motion is in this position. Draw a straight line $n\ o$ any convenient distance above and parallel to $L\ M$. Through h, the point of intersection of the line $L\ M$, and the arc $d\ l$ draw a straight line $h\ i$ perpendicular to $L\ M$, the point of intersection of the line, line $h\ i$ and the line $n\ o$ will represent the edge of the valve as shown.

From the line $h\ i$ and on the line $n\ o$ lay off a point p $\frac{1}{16}$ of an inch from $h\ i$, then this point p will represent the outer edge of the steam port, and the distance between the point p and the line $h\ i$ is the lead when the link motion is in full gear. Let us now assume that the link has been moved into mid-gear as shown by the dotted lines, but without disturbing the position of the crank and that of the eccentric centers f and b. Through h_2, the point of intersection of the line $L\ M$, and the new position of the link arc $d_2\ l_2$ draw a straight line $h_2\ i_2$; the distance between this line and the outer edge p of the port will represent the lead when the link is in mid-gear, and, as will be seen, this lead is greater than the lead when the link is in full-gear.

In a similar manner it can be proved that the lead gradually increases when the link is moved from full-gear towards mid-gear. Again, by simply increasing the length of the eccentric rods, the difference between the lead when the link is in full-gear and the lead when the link is in mid-gear is decreased. Thus making the length of the eccentric rods equal to twice the length as before, but not changing the position of the crank and the centers f and b of the eccentrics, the link will occupy the position as shown, X, then by drawing the valve seat in the correct place, following the same method of construction as before, it will be seen that the difference in the lead (or in other words the distance between the line $h\ i$ and $h_2\ i_2$) when in full-gear, and the lead when the link is set in mid-gear is less than when shorter eccentric rods are used. From this we learn that the magnitude of the variable character of the lead depends upon the length of the eccentric rods, and that in practice, where it is generally desirable to keep the lead as nearly constant as possible, we must make the eccentric rods as long as the design of the engine will admit. In locomotives when in full-gear the lead is generally $\frac{1}{16}$ of an inch, sometimes a little less, and this lead is increased to $\frac{1}{4}$ or $\frac{3}{8}$ of an inch, and sometimes even more, by moving the link into mid-gear.

CONNECTION OF ECCENTRIC RODS TO THE LINK.

In order to avoid hereafter any misunderstanding, we again call attention to the fact that this article refers to link motions in which rockers are not employed.

It is always desirable that locomotive slide valves should have some lead, no matter in what position the link is placed, and it certainly would be injurious if the slide valve lapped over the steam port at the beginning of a stroke of the piston. Now to avoid having lap at the beginning of a stroke, the eccentric rods must be correctly connected to the link. Notice, for instance, the manner in which the eccentric rods are connected to

trace quickly and clearly the effect of the position of the link on the lead of the slide valve, we have shown the latter and its seat above the line $L\ M$ and parallel to it. The distance between the valve seat and the line $L\ M$ is immaterial; it can be placed at any convenient height, without affecting the correctness of our reasoning; but the distance between the line $S\ T$ and the end of the valve seat is important, and should be placed in a position as will be presently explained.

In Fig. 168 the point c represents the center of the driving axle; the circumference $f\ b$ represents the path of the centers of the eccentrics, f the center of the forward eccentric, and b the center of the backward eccentric. The arc $d\ l$ represents the link arc, that is, an arc drawn through the center of the link opening; and the arc $e\ g$ represents the arc in which the centers of the eccentric rod pins are located. In this figure the link motion is shown to be in full-gear. The center of the crank-pin is at U, and consequently the piston will be at the beginning of its back stroke.

When the link motion is in full-gear, or in mid-gear, or in any intermediate position, the point of intersection h of the line $L\ M$, and the arc $d\ l$, will always represent the position of the center of the valve rod pin; and since the distance between the valve rod pin and the slide valve is constant, it follows that

the link in Fig. 168. Here, as will be seen, the eccentric rods do not cross each other when the piston is at the beginning of the back stroke. But now let us examine Fig. 169, which represents precisely the same valve gear as that shown in Fig. 168, but with this difference—the eccentric rods are crossed when the piston is at the beginning of the back stroke. Note the result. If it is the intention to use the link simply for the purpose of reversing the motion of the engine, then this manner of connecting eccentric rods to the link would work very well, but as soon as the link is used for the purpose of changing the point of cut-off, then this arrangement of eccentric rods will have an injurious effect, particularly so in locomotive engines, as we can readily see by inspecting Fig. 169. In this figure the full lines represent the mechanism to be in full-gear, and the dotted lines represent the same to be in mid-gear. Drawing a line $h\ i$ perpendicular to the line $L\ M$ and placing the valve seat in its proper position as explained in connection with Fig. 168, the distance between the line $h\ i$ and the outer edge of the steam port p, Fig. 169, will be the amount of lead when the link is placed in full-gear. On the other hand, when the link is placed in mid-gear, as shown by the dotted lines, and drawing a line $h_2\ i_2$ through the point h_2 perpendicular to the line $L\ M$, we find that instead of having lead—as we should have—the slide valve laps over the steam port when the piston is at beginning of the a stroke, which is a bad feature, and must be avoided in locomotive construction.

The 125 steamships plying between the United States and Europe cost $100,000,000, employ 18,750 men, spend $1,000,000 a month for coal, carry 500,000 passengers a year, and earn $22,000,000 for passage money, exclusive of what is paid for freight.—*N. Y. Herald.*

New Combination Surface Gauge.

The combination tool illustrated on this page is intended for the use of all classes of artisans, especially machinists, pattern and model makers, tool makers, die sinkers, and engravers. It is light and yet strong.

When the pointer is set in position as at *A A*, it is a surface gauge; but when set as at *B B* it is a depth gauge; and when set as at *U U* it is a distance marking gauge.

The pointer is fastened in every position by the same nut, without removing or chang ing the stud in any manner. The pointer is made of Stub's best refined steel, hardened and tempered. The stud also is of steel.

The base of the gauge is two inches long, and one and one-eighth inches wide; the working surface is correctly finished by scraping.

This tool is manufactured by J. Wyke & Co., East Boston, Mass.

Safety Benzine Can.

The benzine can shown herewith by cut is not a new article, but is one not largely known. It is intended for use in a newspaper office, but is just as useful anywhere else that benzine is used. It affords protection against fire, which benzine as ordinarily kept is a prolific agent in starting up.

The top is arranged so that no fumes or gases can escape, but is so adjusted with springs that the benzine will flow readily when the can is in use.

The can is made by R. Hoe & Co., 504 Grand Street, New York. Pint and quart sizes are made, both of brass.

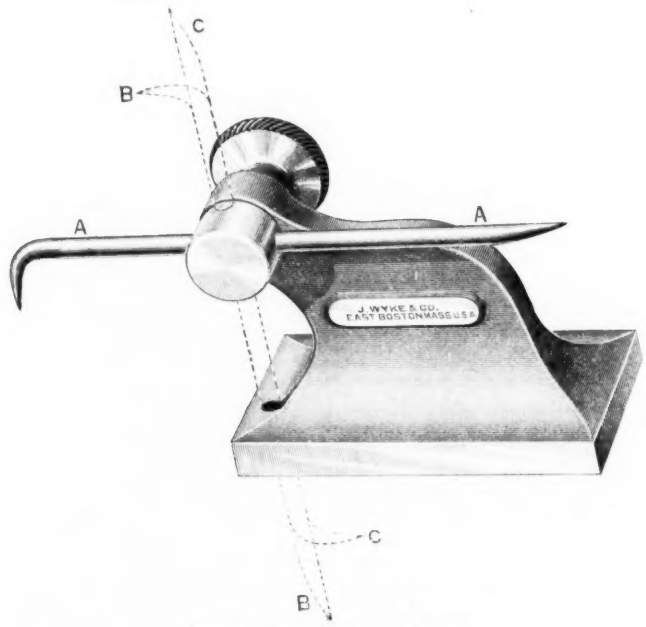
Safety Benzine Can.

Core Making in Foundries.

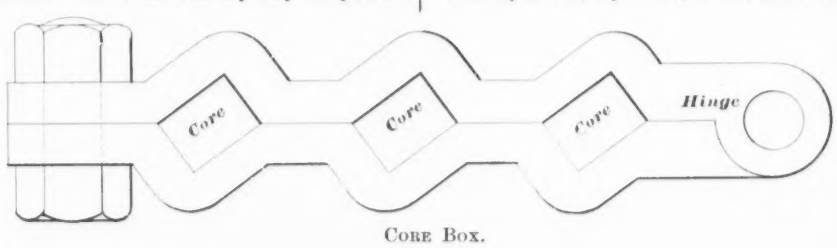
By David Spence.

Core making in an agricultural foundry constitutes about one-third the work. And it is a branch of foundry practice that has not made much progress. But since I have taken charge of these works I have made some improvement in the way of core making. The drawing I send will give a view of the end of a core-box with a hinge on one end of the box, and the other end is clamped while the cores are being rammed up. This way gives the core maker a chance to ram up three cores in about the same time that it would take him to make one in the old-fashion box. We make a great many hubs for planter wheels, sometimes 8,000 a year, and that takes 8,000 journal cores with a chamber in them. Instead of making the cores in halves, as they do in some foundries, we make a nice light shell, and when the core is moulded put the shell on it and dry in the shell instead of making in halves and pasting. I use a great many iron cores or chills, as some would call them, on a regular line of work. It is a great saving to the company, and makes a nice smooth hole. Should any of our foundry friends have trouble in making small cores I will give some of my own practical experience. I had a small core that gave trouble by blowing in the mould. Instead of mixing the sand with flour I took the sand and dried it and then mixed it up with coal tar instead of flour, and all trouble from blowing was at an end. Some one will say why did you not use rosin? I did not have any way of grinding, and I found the tar much quicker.

I once had a broken down job come in the foundry a short time before a cast; there was a 6-inch core in the center of the piece, and no core in the shop that size made. I went to a tin shop, had a tin shell made 6 inches in diameter and of the right length; then rammed up the shell with green sand, and I had my core in time for the cast. It was a good one. The tin shell was left on the green sand.



Combination Surface Gauge.



Core Box.

Fair of the American Institute.

This exhibition is not up to the usual standard this year, so far as the display of machinery is concerned. There are some good machinery exhibits, but they are neither numerous nor large. The steam engine exhibit is particularly small, and possesses an entire lack of novelty. Outside of machinery there is about the usual variety, but there is but very little that is in any sense new.

In gas engines, A. C. Manning, of New York, makes a good exhibit of the "Otto." One 4 horse and one 10 horse are shown in operation; it is needless to say that they run very smoothly, and attract a good deal of attention notwithstanding their position at the remote corner of the building is not the best. An "Otto" pump (gas motor) is also shown. The pump has a capacity of 7,500 gallons of water per hour, raised to a height of 100 feet. It is said to do this work at a cost of 15 cents.

The Williams & Orton M'f'g Co., Sterling, Ill., exhibit the Charter gas engine in operation. This engine possesses novelty in the way of construction, and turns very regularly and smoothly.

C. H. Delamater & Co., New York, make a good exhibit of pumping machinery, including a variety, in sizes, of hot air pumping engines; also of steam pumps.

In machine tools E. Gould & Eberhardt, Newark, N. J., exhibit a tool grinder, in use, one of their latest design of automatic gear cutters, two shapers and two automatic upright drilling machines. These last named machines, particularly, receive a good deal of attention and favorable comment from mechanics.

The Hendey Machine Company, Torrington, Conn., show three of their well known shapers, with recent improvements; also two small planers. While neither Gould & Eberhardt's nor the Hendey Company's exhibit is large, they are both very creditable, and certainly exhibit progress in many of the details.

Bradley & Co., Syracuse, N. Y., show two upright and two helve hammers. They have no forge, but the hammers are belted, and operated on a cold bar of iron, which speedily becomes red hot under the quickly-repeated blows.

Beaudry & Cunningham, Boston, Mass., also have on exhibition several power hammers in different sizes. They have a forge, and show hammers in use on regular work.

The Stiles & Parker Press Company, Middletown, Conn., show a line of small presses, some of them at work. It is a very fine exhibit, but embraces but little of their extended manufacture in the way of presses and similar tools.

The Howard Metallic Brush Company, Boston, Mass., also show presses with Horton's friction, and a variety moulder which runs at the high speed of 10,000 revolutions per minute.

J. A. Crouthers, New York, shows in several sizes the Nagle power pump, more particularly designed for a boiler feeder.

T. Kieley, New York, exhibits a return steam trap, the Eureka damper regulator, also his system of steam heating for buildings.

The Diamond Emery Wheel Company, Providence, R. I., show some of their emery grinders doing very effective work.

F. B. Smith, New York, as manufacturers agent, exhibits a large variety of oil and grease cups with sight feed, including a loose pulley cup; he has also several other specialties on exhibition.

Now that the elections are over we trust that the strain has been taken off some of our Western industrial contemporaries who have been advising the voters of New York City whom they should not support for local office.

Steel tubes are not in as much favor for locomotive boilers as they were, for the reason that when the ends are burned out—and the ends always burn out first—they cannot be repaired, which objection does not inhere in iron tubes, as they can be welded with facility. —*American Manufacturer.*

No Progress Towards Free Trade.

The London *Times* in reviewing the results of our elections last week says:

"The Protectionists, however, have been reinforced, both among the Republicans and the Democrats; nor is there any prospect of an approximation to free trade during the next two years. In the Northwest, it is true, there are signs of a reaction provoked by Mr. Blaine's protectionist campaign in Pennsylvania, but this is much more than counterbalanced by the movement in the opposite direction in the other sections of the republic."

It must require a great deal of faith and hope even to see signs of a reaction in the Northwest. With the defeat of the most prominent free traders who have labored assiduously in the present Congress to reduce the tariff, it is safe to say there is no chance for working towards a destruction of the protective tariff during the next two years.

Enforcing a Wholesome Law.

We are glad to see that there is a prospect of enforcing the U. S. law against the importation of laborers, passage prepaid under contract to work for the parties importing them. The law has been flagrantly violated, and when the Commissioners of Emigration at Castle Garden placed the facts, with ample proof, before the U. S. District Attorney in this city he refused to prosecute. Some time ago 48 foreign laborers were imported contrary to law, and put to work in a mill in Rhode Island. The owners of the mill, however, do not seem to have been willing to carry out their contract with the laborers in the matter of wages. The laborers then took legal counsel to oblige the mill owners to carry out their contract. After the case was thus brought to public attention the U. S. District Attorney in Rhode Island felt obliged to take action and accordingly caused writs to be served on the owners of the mills to recover the penalty of $1,000 on each laborer imported. The writs are returnable Nov. 15th. Every sincere friend of law and order will rejoice to see the penalty enforced if the parties have violated that law.

Orders for cars and locomotives seem to be on the increase, and in some degree that is the case with machine tools.

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NEW YORK, NOVEMBER 20, 1886

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Protection Strongly Endorsed by the People.

Two or three months ago the free traders and "revenue reformers" ground up their battle-axes and announced that they would enter the conflict for electing members of the fiftieth Congress. They declared war against the election of protectionist members, and even named some who are in the present Congress as the especial objects of their displeasure. It was an unusual and bold departure for anti-protectionists to take, as they had generally kept very quiet before election, but they asserted that public sentiment had changed regarding the tariff, and that the time had come for action. The result of the elections must be sadly disappointing to these would-be reformers. Instead of suffering loss the cause of protection has been strongly advanced, showing that the people are determined more than before to maintain the successful industrial policy of the nation upon which so large a share of our prosperity rests. There is no doubt that the newly elected fiftieth Congress will have a stronger protection majority than the forty-ninth or the forty-eighth. This will be decidedly encouraging to the business improvement which is now visible nearly everywhere, and will help it forward in no small degree.

It is especially noticeable that several "revenue reform" members of the present Congress have had a difficult job to secure their re-election. Even so prominent a statesman as Mr. Morrison is defeated, and Carlisle barely escaped the same fate.

The election returns will be unpleasant to our English cousins, who have been waiting for a large breach in the "Chinese wall" through which to send their surplus of manufactured goods.

Stoves in Railroad Cars.

The recent railroad accident in which several persons were burned to death calls forth the usual press condemnation of the car stove, and that will be the end of the matter till the next accident attended with similar results. It is assumed that there is no convenient substitute for the coal stove for heating cars, which is perhaps true if by convenient we understand something as cheap as stoves. But this same argument might have been applied to automatic brakes for passenger trains, and would have been if their use had not been a saving in dollars and cents to railroad companies. The difficulty in introducing these brakes on freight trains is because of the trouble in showing that they will pay in dollars and cents. The question of safety to life has but little consideration.

In the matter of heating cars railroad corporations are waiting for some one to show them how to do it at less cost than under the present practice. The peril to human life will have but little to do with the adoption of some other plan, at least not until public opinion becomes strong enough to enforce its demands by legislation.

Two Exemplary Trade Unions.

On another page of this issue we present some extracts from a speech delivered by the Chief of the Locomotive Firemen's Brotherhood, at their convention in Minneapolis. This is a trade union which has been in existence thirteen years. It numbers over seventeen thousand members and has never had a strike. Two weeks ago a convention was held in this city by the Brotherhood of Locomotive Engineers, a union numbering over twenty thousand members, which has had no strike for several years. Both these unions exist for the protection of their members. They are not organized out of hostility to railroad companies, but do everything necessary to promote good will between employers and employed. When differences arise they are always ready to submit to arbitration. They have rendered obsolete, so far as railroads are concerned, the old notion that it is a loss of dignity or a relinquishment of personal rights for an employer to treat with the representatives of a national trade union to settle labor difficulties in his own establishment.

This fact was well set forth by President Chauncey Depew, of the New York Central Railroad, in welcoming the convention to the city. He said he believed that there is not a railroad president in the country, who, when the locomotive engineers of the Brotherhood have anything to say and knock at his door, will not dismiss all others, admit the engineers and give them attention.

English Manufacturers Taking Advantage of Protection.

The following leading editorial in a recent issue of the London *Ironmonger* we copy entire:

The report of the John Cockerill Company, of which we published the leading features last week, contains several passages which are of much general interest. Especially so are the allusions to the steps which have been taken, or are proposed to be taken, in order to evade the incidence of the protective tariffs of certain other countries. The report says the shareholders must be prepared to sanction the erection in foreign countries of fully equipped iron works, capable of competing with already existing native establishments. In this way it is proposed to erect blast-furnaces in the Bilbao district of Spain, works were to have been established in China had it not been for the Franco-Chinese war, and a gun factory is to be erected in Morocco. In Russia steel works are already being constructed, so that the Belgian concern has gone far beyond the region of mere theory, and has put its views in force in a thoroughly practical manner. Being convinced, apparently, that there are countries in which trade cannot be done from the chief works of the company, it is held that the only way out of the difficulty is to pass the protective Rubicon and attack in the rear, by setting up works within the territory around which the tariff wall stands. This is a bold policy, it must be confessed, but it is not wholly novel, having been adopted by many British capitalists in respect of Germany, France, Spain, Belgium, the United States and other countries. It is relatively easy, indeed, for capital to thus migrate, but it is bad for the original country that it should do so. In our case, for instance, when a large undertaking is moved into the United States we lose all the employment and profits of labor, and receive only the net profits of the working of the concern as a whole. Even this must have a diminishing tendency in the course of time, owing to the admission of other parties, or the necessity for the original owners to reside near the works. This tendency has long been in operation with regard to the United States, where an enormous amount of British capital is invested in the manufacturing industries of that country. British labor naturally suffers most, as it is not so mobile as capital, but the country as a whole must be a constant loser by the withdrawal of the capital and the profits arising from its continual turnover in almost all grades of society. When confronted, as the Cockerill Company seems to be, with the awkward alternatives of setting up branch works or losing its business with the countries mentioned, there can be no question as to what the decision must be. The great Belgian company, therefore, is simply exercising common sense in taking the only course open to it under the circumstances. It may, and will, probably, lose something at home, but its shareholders will be provided with an investment abroad which may be expected to prove very lucrative. There is a parallel case in South Russia at present—as there has been for some years past—where a concern which is essentially English in capital, management, etc., enjoys a large bonus from the Russian Government, and is believed to pay its owners large profits. Such displacements of capital and labor are decidedly disagreeable, but when they become inevitable it is best that they should be accelerated, and that the development of the resources of countries which are so blind as to resort to protection should be in the hands of British capitalists.

It seems from the above that those "countries that are so blind as to resort to protection" are adding to their resources by so doing and that free trade Britain "as a whole must be a constant loser by the withdrawal of the capital" that is coming to the United States and other protective countries for investment in productive industries. What terrible blindness, to be sure! This same blindness, if persistently maintained for many years more, bids fair to swell the manufacturing industries of this country far ahead of those of England. Of course it is galling to English pride to "lose all the employment and profits of labor," and rather unfortunate to have their manufacturing industries move to protection countries. The only remedy for this state of affairs that we can suggest is to prevail upon the people of those countries that now have protection to discard it for free trade. As far as the United States is concerned in such a movement the recent election for members of Congress shows that it would be the largest kind of an up-hill task.

A reader sends us a description of a so-called "important invention" clipped from the *Sedalia Daily Democrat*, and asks us to throw some light on the power developed by the Depp motor, which he says is a mystery to him. We have not seen this motor, and therefore cannot express an opinion in regard to it. If the invention is so valuable, as stated in the *Sedalia Daily Democrat*, drawings and illustrated descriptions of the motor with opinions in regard to it will soon be published. . On the other hand if these drawings do not appear in print you may consider the invention worthless.

If N. S. J., Paterson, N. J., will send us his name in full we will answer his questions through our columns, otherwise we cannot do so.

Literary Notes.

"Ginevra, or the Old Oak Chest," a Christmas story, by Susan E. Wallace, with illustrations by Gen. Lew Wallace, is an attractive book for children just issued by Worthington & Co., 774 Broadway, New York.

ELECTRICITY IN THE SERVICE OF MAN. A Popular and Practical Treatise on the Applications of Electricity in Modern Life. From the German of Dr. Alfred Ritter von Urbanitzky. Edited, with Copious Additions, by R. Wormell, D. Sc., M. A. Published by Cassell & Co., 739 and 741 Broadway, New York.

This is a very complete work, and we believe it to be a book of great value to those who wish to obtain a clear insight into the whole science of modern electro-technics. In the first part of the work the principles of electrical science in their historical sequence are expounded, and the second part treats on the applications of electricity to industrial life. The treatment of the subjects is such as will not require on the reader's part any special knowledge beyond that of ordinary education. It contains 859 pages and 836 excellent illustrations; and the complete index makes the work valuable as a book of reference. The price is $6.00.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

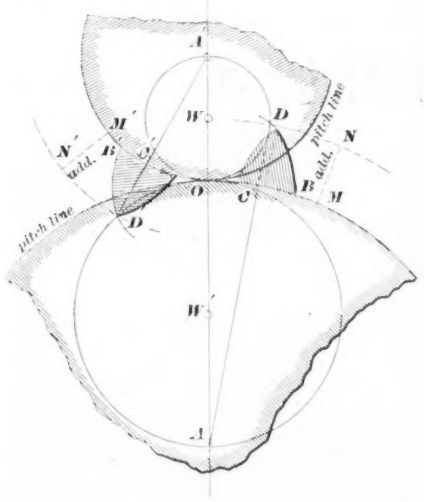
Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(396) O. F. writes: Will you give me a rule for finding the shortest radius of a curve on which a locomotive will run? *A.*—The shortest radius of a curve on which a locomotive can run depends upon the type of the locomotive employed. The simplest method for finding the shortest radius of this curve is as the following: Draw to a scale a plan of the wheels of the rigid wheel base, and then by trial find shortest radius of a curve which will not bind the flanges of the wheels.

(397) E. P. C. writes: 1. What will be the collapsing pressure of a steel tube circular in form, inserted into a case which is assumed to be strong enough to resist any required pressure? The tube is 8 inches in diameter and 10 inches long. The thickness of metal is ¼ of an inch, and has a tensile strength of 60,000 pounds. One end of the tube is closed by a head which is much stronger than the tube. The other end of the tube is open to the air, and is riveted to the head of the case. *A.*—The pressure required to collapse the tube will be much greater than the pressure required to force the tube out of the case, and therefore you cannot obtain pressure enough to collapse it. 2. Please give me rules for the solutions of problems

relating to the above. *A.*—You will find rules relating to the collapsing pressure of cylinders and flues in Professor Robert H. Thurston's book on the "Materials of Engineering," Part II.

(398) J. F. G. writes: I am muddled on the gear question, and would like a few points straightened out from a table on the limiting number of teeth of spur wheels. I take the following examples, which seem rather antagonistic: A pinion of 7 teeth will drive wheels of not less than 50 teeth, provided the arc of recess equals the pitch; 12 teeth of the arc of recess equals ¾ the pitch, and 9 teeth of the arc of recess equals ⅔ the pitch; and if the wheels drive the pinion, the same table gives no number at all for driving a pinion of 7 teeth when the arc of recess equals the pitch, and the least number of teeth in a pinion driven by a wheel is ten (10), the wheel having 382 teeth. Why won't a pinion of 7, driving a wheel of 50, be driven if the motion is reversed? Then, again, a pinion of 7 (the table says) can be driven by not less than 33 teeth. If the arc of recess equals ¾ the pitch, why can't 12 drive as well as be driven by the 7-toothed pinion? Again, if the arc of recess equals ⅔ of pitch, a pinion of 7 teeth can be driven by 11. Will you kindly explain to me what this arc of recess is, and what it has to do in limiting the number of teeth, and if there is any limit to the arc of recess? *A.*—We have submitted these questions to George B. Grant, who sends the following reply: The limiting numbers given will apply only when the teeth are cycloidal, when the flanks are radial, so that the describing circle for each face is of half the pitch diameter of the mating gear, when the tooth covers half of the circular pitch, and when the circular pitch and the arc of recess are both given. The



arc of recess is the arc *O B*, through which the driving gear moves while the point of contact is moving the whole length of its face from *B* to *D*. Its length will depend upon the addendum *M N*, and the diameter of the circle *O A'* that describes the face curve *B D*. To determine the maximum arc of recess, draw the addendum circle *D N*, and lay off the required arc *O B* equal to *O D*. To determine whether the two gears with centers at *A* and *A'* will or will not drive each other, make the construction shown by the figure. Draw the describing circles with centers at *W* and *W'*, each of half the diameter of the mating gear; lay off the arc *O D* equal to the given recess *O B*, and draw *D C A*. If *B C* is equal to or less than a quarter of the given circular pitch, the gear *A* will drive the gear *A'*; but if more, as shown by the figure, even a pointed tooth will leave contact with the flank of the mating tooth before the given recess has been used. The fact that a gear may drive a larger one, when it cannot be driven by it, is owing to the fact that the describing circle for the faces of the small gear is the largest. The larger the describing circle, the smaller will be the quarter tooth *B C*. It is seen that *B' C'* is smaller than *B C*, so that if *B' C'* is just a quarter of the given pitch, *B C* will be more than a quarter of it, and *A* will not drive *A'*, unless the tooth is more than equal to the spaces between the teeth. If the tooth and space are not equal, we can have a thick tooth on *A* and a thin one on *A'*, so that contact will not cease before the given recess is passed over. The arc of recess cannot be less than half the pitch, and it should be as much as possible more than that.

(399) W. M., Buffalo, asks: Please give me a practical method for finding the length of an eccentric rod in cases where it is not practicable to draw a center line along the shaft, from which the angular advance can be laid off? *A.*—You will find the information you seek in an article on Modern Locomotive Construction, which will appear in the AMERICAN MACHINIST at an early date.

(400) G. D., Toronto, Ont., asks: 1. How can I harden a drill so that I can drill some pieces of an old saw blade? *A.*—We think you can harden your drill in clear water to accomplish the purpose. Run the drill slow. If you do not succeed in this way, try cooling in mercury. 2. How are the flutes in reamers polished after hardening? *A.*—They are ground, in bringing the reamers to size with a small emery wheel mounted in a suitable machine. Steel squares are put together square, and the tongue fastened in place.

(401) F. A. H., Dalton, Ga., writes: 1. We are troubled with a deposit of lime about 1-16 inch thick in our boiler. What will remove it? *A.*—Such scale is difficult to deal with. Perhaps the use of crude petroleum will be as satisfactory as anything. 3. Our draft is not sufficient to keep the flues of boiler clean. We fire under the boiler, the fire returning back through one-half the flues, then back again through the other half. Would it not be better economy to return once through all the flues? *A.*—We assume that the construction of your boiler is such that it is best to return as you do. We could not advise to the contrary without knowing full particulars of construction, and temperature of the escaping gases.

(402) M. J. G. writes: 1. The following are rules for finding the safe working pressure in iron boilers. Are they right? To my understanding, they are not right.

For single riveted joints:

$$\frac{\text{Thickness of metal} \times .56 \times 10000}{\text{Internal radius of boiler}} = \text{Safe working pressure in pounds per square inch.}$$

For double riveted joints:

$$\frac{\text{Thickness of metal} \times .70 \times 10000}{\text{Internal radius of boiler}} = \text{Safe working pressure in pounds per square inch.}$$

In these rules the tensile strength of iron is taken at 50,000 pounds, and the factor of safety at 5. *A* — These rules are right, with the exception of the factor of safety. We prefer, like a number of other engineers, to adopt 6, or in some cases 8, as a factor of safety instead of 5. 2. In calculating the area of the heating surface of a boiler, why are the products divided by 144? *A.*—When the products of the length and breadth of the heating surface are in square inches, then, in order to bring these into square feet, divide by 144, because one square foot contains 144 square inches. 3. In order to find the horse-power of a boiler, why do some engineers divide the heating surface by 15 and others by 14? *A.*—Because some steam engines require 15 square feet of heating surface for every horse-power developed, and others require less.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N.Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

20", 25," 28" B.G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

The best wire nail and tack and nail machinery. Wm. A. Sweetser, Brockton, Mass.

Ice and Refrigerating Machines. 120 built, and all successful, by David Boyle, 521 Monroe, Chicago, Ill.

Inventions, Models, Gear-cutting and light mechanical work. A. P. Brown, 108 Liberty st., N. Y.

For Best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th st., N.Y. Send for des'n.

Curtis Pressure Regulators, Curtis Return Trap. Curtis Damper Regulator. See Nov. 13, p. 12 Send for circular No. 17. Curtis Reg. Co., Boston, Mass.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Machinists' supplies, brass goods m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N.Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co. 111 Liberty st., N. Y.

"Hints to Steam Users, Engineers and Firemen." A 100-page book on care of steam boilers; just issued; containing useful rules, tables, etc; a valuable book for engineers; sent on receipt of 25 cts. in stamps. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York

MANUFACTURES

Baldwin & Co., of Dawson, Fla., are erecting a planing mill.

A brass foundry is being erected at Chattanooga, Tenn., by John A. Lee.

Henry Zettner will erect a $16,000 brewery on 170th street, New York.

McMahon & Wren, of Bridgeport, will erect a large brewery in Meriden, Conn.

H. Robins, Brooklyn, N. Y., will erect a boiler shop shed, 150x50 feet, on Elizabeth street.

The Eureka Manufacturing Company, Palestine, Texas, are enlarging their machine works.

Geo. Buller & Co. will erect a $35,000 elevator at 305 Michigan avenue, Chicago.

Gardner & Co., of Catskill, N. Y., will erect a new foundry and machine shop.

The Rochester Plow Company, of Rochester, N.Y., will build a new factory near Culver Purk.

Goodwin & Co., Grand street and East River, N. Y., will build a $10,000 addition to their tobacco factory.

O. D. Wetherill will build a four-story factory on Quarry, near Cologne street, Chicago, to cost $10,000.

It is reported that the Camden Manufacturing Company, Camden, Ark., are enlarging their woolen mill.

Thomas Young is preparing to start a stove foundry at Alexandria, Va. He has purchased a site.

The Lehigh Valley Railroad Company has received an order to build 100 Tiffin refrigerator cars at the Packerton, Pa., shops.

It is reported that the Toledo and Ann Arbor R.R. will build shops at Alma, Mich.—Jas. M. Ashley, manager, Toledo, Ohio.

H. Disston & Sons, of Philadelphia, will erect steel works at Butler, Pa., ten acres of land having been donated by the town.

H. M. Carpenter, of Averill, Carpenter & Co., Minneapolis, Minn., has been in Duluth with a view, it is said, of locating a wood-pulp mill.

The Birmingham Gas and Illuminating Company, Birmingham, Ala., have ordered machinery for an incandescent electric light plant.

The proprietors of the Nepperham Silk Mill, Yonkers, N. Y., contemplate moving their plant to some point in Pennsylvania.

The Baldwin Locomotive Works, of Philadelphia, are turning out fifteen locomotives a week, and have 3,800 men upon their pay rolls.

A new furniture factory has been started by A. Armstrong at Spartanburg, S. C., in the building formerly known as W. D. Fowler's machine shop.

The works of the Diamond Drill Company, at Birdsboro, Pa., have been compelled to shut down for want of water, and fifty men are out of employment.

Proctor & Gamble, of Ivorydale, near Cincinnati, will erect some additions to their large soap manufacturing plant. They will include a machine shop and a boiler house.

A company will be formed at Atlanta, Ga., by Frank A. Smith, of Steelton, Pa., and others, to manufacture his ice machinery. The capital stock will probably be $100,000.

The Alabama and Tennessee Coal and Iron Company have arranged to build three 150-ton furnaces at Sheffield, Ala. Work is to be commenced within ninety days.

The Clark's Mile End Spool Cotton Company, Passaic avenue, Newark, N. J., will erect a five-story brick factory and two-story carding house at Bishop street and Grant avenue. Cost, $175,000.

The Reading Iron Works, at Reading, Pa., are about to erect a large pipe mill adjacent to their plant in that city. The new structure will be about 100 feet wide and nearly 300 feet long.

The New York Locomotive Works, Rome, N. Y., turned out sixty engines in the last six months. They have orders nearly sufficient for all winter's work.

A. O. Lane, W. T. Underwood, R. W. Boland, W. G. Lunsford and G. B. West have incorporated a stock company at Birmingham, Ala., to manufacture corrugated iron. The capital is $100,000.

The Sheffield Furnace Company, Sheffield, Ala., will erect a second furnace as soon as their first is completed. The capacity of each will be not less than 125 tons per day.

The Schofield Metal Cross Tie Company has been incorporated at Chattanooga, Tenn., to manufacture steel ties and operate a rolling mill, by J. Schofield, E. M. Schofield, M. Grant, H. W. Grant and Geo. W. Chapman.

W. P. Davis, North Bloomfield, N. Y., has issued a circular with thirty-six testimonials from parties who have used his key-seaters and drill presses. They all speak highly of the tools. A long list of customers is also appended.

The Norfolk and Western Railroad Company have placed with the Roanoke Machine Works, at Roanoke, Va., an order for 1,000 cars and 12 locomotives. So great is the activity at this immense establishment that 1,000 hands are now employed.

A company has been organized with a capital stock of $175,000 to erect a charcoal furnace at Decatur, Ala. Work will be commenced as soon as a site is donated. H. M. Pierce, Calera, is president.

Ground has been purchased in Birmingham, Ala., for the depot and machine shops of the Goodwater and Birmingham Railway Company, previously reported as incorporated by W. G. Raoul, of Savannah, Ga., and others.—*Baltimore Manufacturers' Record.*

The Thorp Gorden Press Company, of Cleveland, O., formerly H. H. Thorp Manufacturing Company, has been incorporated. Capital stock, $50,000. Henry C. Miller, Henry H. Thorp, Louis C. Heckman, 417 Prospect street; Harry E. Chapman and Malva Daniels, corporators.

Ground has been broken at Watsontown, Pa., and a large force of men put to work upon the erection of a large nail mill. The capital to be employed will be $60,000. Two large engines will be put in, of 350 horse-power, with a rolling mill attachment. The new industry will give employment to 300 men.

Among the boilers recently ordered from the National Water Tube Boiler Company, New Brunswick, N. J., are the following: One for Ivanhoe Paper Company, of Paterson, of 216 horse-power, and one for Bloomfield Mills, Princeton, N. J., of 100 horse-power. They report an increasing demand for their boilers, and are increasing their facilities to meet it.

J. Wyke & Co., of East Boston, Mass., write us: We wish to say that we thoroughly appreciate the AMERICAN MACHINIST, as previous to advertising in its columns our business was limited entirely to this country, but now we are sending our tools, especially our patent screw-cutting, center, depth, angle and twist drill gauge into almost every corner of the United States; also to Canada, England, Germany and Australia.

At Springfield the Government Armory is turning out a finer grade of gun metal by the utilization of flame produced from gasoline. At the Bay State Iron Works a process in the production of steel is giving satisfaction; and at Turners Falls a system of fuel-gas production has been adopted by the Russell Cutlery Company, which is said to equal natural gas, made on the premises and supplied at a price far below the cost of gas at natural gas centers.—*Boston Commercial Bulletin.*

The American Steam Appliance Company, 280 Broadway, New York, and 22 North Fourth street, Philadelphia, report business looking bright. They have sold in Philadelphia within a month a set to F. C. Langston, one to Merchants' Building, one to Fidelity Trust Company, one to Knickerbocker Ice Company, one to Wm. Gray & Sons, one to Keasbury & Mattison, and one to United Gas Improvement Company. They range in size from 42"x36" to 60"x60".

A convention of wagon manufacturers recently met in Chicago, and organized the National Wagon Manufacturers' Association. Its object is to control prices and production, and it is also decidedly opposed to convict labor products. The following officers were elected for the ensuing two years: President, W. T. Lewis, Racine, Wis.; vice-presidents, C. Hotz, Chicago; P. E. Studebaker, South Bend, Ind.; secretary, H. M. Kinney, Winona, Minn.; treasurer, M. Rosenfield, Moline, Ill.

The Cumberland *Daily News* says: "N. W. Howson, for the past seventeen years master of machinery of the Cumberland and Pennsylvania Railroad, has resigned that posision to accept the general superintendency of the Eames Vacuum Brake and Manufacturing Company, of Boston, Mass., and whose works are at Watertown, N. Y. During the long period during which Mr. Howson has held the position at Mt. Savage, he has proved his superior mechanical skill in the construction of fifty-three locomotives—some for the company's own use and others for other railroads."

The Cleveland Twist Drill Company, of Cleveland, O., have issued a new illustrated catalogue of twist drills, self-feeding reamers, tap-cutters, etc., under date of September, 1886. The catalogue is well indexed on the margin, which is an excellent feature. Anything in its 24 pages can be discovered at a glance. A table of speeds for running twist drills has been compiled from data furnished this company by 500 of the largest users of twist drills in the country. The prices are put in the column next to the sizes, which makes the lists convenient.

The Westinghouse engine seems to retain its hold upon public popularity. Westinghouse, Church, Kerr & Co., 17 Cortlandt street, New York, are putting in a great many of them for electric lighting and other purposes. The Lynn (Mass.) Electric Light Company are increasing their plant, and have ordered a fifth Westinghouse engine. The Brush Electric Light Company, of Buffalo, have just ordered two more 60 horse-power Westinghouse engines, making eighteen, which will be running in a single room. The same company are also constructing a central station for incandescent lighting on the Westinghouse system. W., C., K. & Co. also have orders to put in Westinghouse electric lighting plants from F. A. Robbins, Pittsfield, Mass.; the Carbondale Heat, Light and Power Company (1,000 sixteen-candle lights); the Pittsburgh Electric Light Company (2,000 lights); the Danville (Va.) Nail Company; the Pencoyd Iron Works, Philadelphia, and the Pennsylvania Steel Company.

Machinists' Supplies and Iron.

NEW YORK, Nov. 4, 1886.

Iron—While the sales aggregate fairly good, it is still noticeable that transactions are in small lots. Prices are held firm, and, while consumers are not inclined to buy much beyond immediate wants, furnacemen are equally disinclined to cut prices for the sake of obtaining larger orders. Lehigh and North River brands, No. 1 X Foundry, sell at $18.50 to $19; No 2, $17.50 to $18; Grey Forge, $16.25 to $16.50.

Scotch Pig—While but little of these brands is sold, there is no overstocking of the market, prices as a consequence ruling steady and quiet. We quote Coltness, $21.50 to $22; Glengarnock, $19.50 to $20; Gartscherrie, $20 to $21; Eglinton, $19 to $19.50; and Langloan, $21.

Lead—There is no noticeable change in prices or volume of trade. Common pig is held at 4.15c, with slight concessions for future delivery; buyers are not inclined to accept these prices, but expect lower figures.

✻WANTED✻

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Wanted—Competent draftsman experienced in blast furnace and steel works construction; state experience. Address G. L., AM. MACHINIST.

Wanted—Position by an experienced machine shop foreman; salary moderate; references. Address F. F., AM. MACHINIST.

Machinist foreman wanted, who can handle fifty men to advantage, and increase their production by latest improved ways of doing work. Address P., care Wilkinson & Co., 352 Atlantic av., Boston, Mass.

Wanted—By an experienced mechanic, familiar with designing and construction of automatic, high-speed and hoisting engines, also heavy tools, situation as foreman or superintendent; competent to manage men; good references. J. C. E., AM. MACH.

✢ MISCELLANEOUS WANTS. ✢

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent solid lubricant, clean, durable, cheap; prevents hot boxes. Crescent Mfg. Co., Cleveland.

The Crescent automatic grease cup is adapted to every service. Crescent Mfg. Co., Cleveland, Ohio.

Light mach'y of all kinds built at short notice. Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

"Steel Stamps, &c." Agents wanted in every shop; send for terms. J. E. Mathewson, Springfield, Mass.

Wanted—Second-hand Cushioned Hammer, in good condition. Address Pennock Bros., Minerva, O.

Draftsman's Adjustable Curve Ruler; makes any curve; sold everywhere F. W. Davenport, Mfr, Providence, R. I. Circulars gratis.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E.D., N.Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Wanted—A first-class cotton and woolen shuttle maker as partner; a good opportunity for a man (who understands the business) with a small capital. Address Box 4, AM. MACHINIST.

Experimental and new machinery for special purposes built by contract from specifications and inventors' designs; ample facilities. Cohoes Iron Foundry and Machine Co., Cohoes, N. Y.

For Sale—One complete set of Pulley Patterns; also Patterns for Slide Valve Engines, with adjustable cut-off and without cut-off, for sale cheap. Address North Star Iron Works Co., Minneapolis, Minn.

For Sale—One 30 H. P. Fire-Box Boiler, good as new, $375; one Strange Automatic Barrel Stave Saw Mill, used but a short time; also a number of Portable and other Engines and Boilers. Address Ezra F. Landis, Lancaster, Pa.

For Sale—Foundry, Machine and Boiler Shops; brick buildings, with all modern improvements in tools; build Corliss engines, and doing good business; good reasons for selling. Address J. P. Dennis, Sioux City, Iowa.

For Sale—18-inch Engine Lathe, 28-inch Drill Press, 24-inch × 6 ft. Planer, large Milling Machine and Crank Planer, all new modern tools; also some 10, 12, 15, 20 and 35 H. P. second-hand Engines. First-class, very cheap. S. M. York, Cleveland, O.

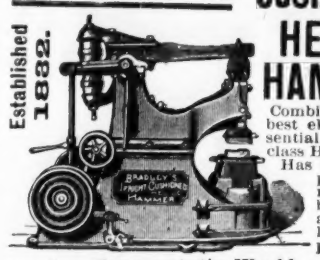
For Sale—The machinery, tools, plating apparatus and raw material of manufacturing establishment; now working on orders in brass and other metals; very low rent, including steam power. Address Manfr., P.O. Box, 285, New Brunswick, N.J.

For Sale—Machine for twisting or spiraling cold wrought iron or steel; capacity, ⅛" to 1", square or round; any length bar or any pitch of spiral. Address Spiral, AM. MACHINIST.

For Sale—A first-class foundry and machine shop; large connection in saw-mill county in the South, including buildings, lots, machinery, and mills' supply stock on hand; business will be carried on until sold; reason for selling, retiring from business; apply at or address Southern Foundry, AM. MACHINIST.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

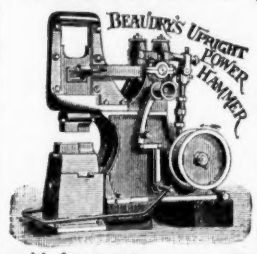
Established 1882.



Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other **Hammer** in the **World.**

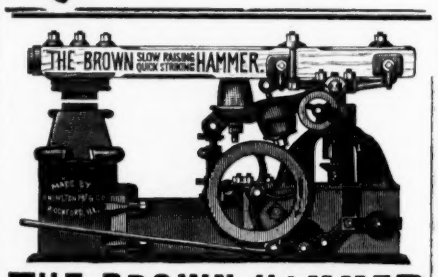
BRADLEY & CO. Syracuse, N.Y.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER



The success of our machine is the best proof of its value. Is more like a steam-hammer than any other, yet has all the economic advantages of a power hammer, and is far superior to any. Will work a larger bar of steel or iron and turn out more difficult forgings than any other hammer made. **Guaranteed as represented, or no sale.**

BEAUDRY & CUNNINGHAM,
Boston, Mass.



THE BROWN HAMMER
STRIKES A BLOW WITH
Double the Velocity That it Raises the Hammer.
A NEW MOVEMENT! SEND FOR DESCRIPTION
Knowlton Mfg. Co., King St., Rockford, Ill.

STEPHENS PATENT VISES.

50 PER CENT. OF time and labor saved by using this solid, strong, durable, quick-working Vise. Has the Improved Taper, Pipe and other attachments. Sold by the trade. Send for circular

MELVIN STEPHENS, Prop'r.
Office, 41 Dey Street, New York

S. Ashton Hand Mfg. Co., Toughkenamon, Pa.

Hand's Twist Drill Grinding Attachment.

Readily attached to any grindstone, emery or cutter-grinder. Grinds right and left hand drills from ⅜" diam. down to smallest sizes made. PRICE, $20.

MACHINE SHOP.

Thoroughly equipped, with established business, both new work and repairing, will be sold for less than inventory, or rented with steam and water-power. Very desirable opportunity for a practical machinist with a small capital. Address for circulars, &c. O. A. BECKWITH, COLLINSVILLE, CT.

GEO. F. BLAKE MANF'G CO.

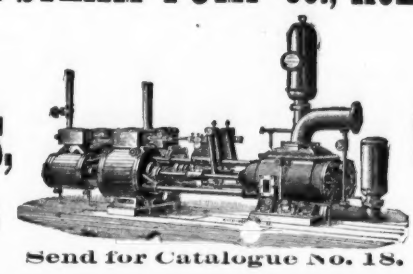
BUILDERS OF EVERY VARIETY OF

95 & 97 LIBERTY ST., NEW YORK. 44 WASHINGTON ST., BOSTON.

WATER WORKS PUMPING **ENGINES A SPECIALTY**

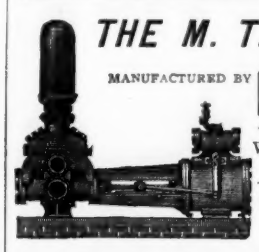
THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



Send for Catalogue No. 18.

THE M. T. DAVIDSON IMPROVED STEAM PUMP,



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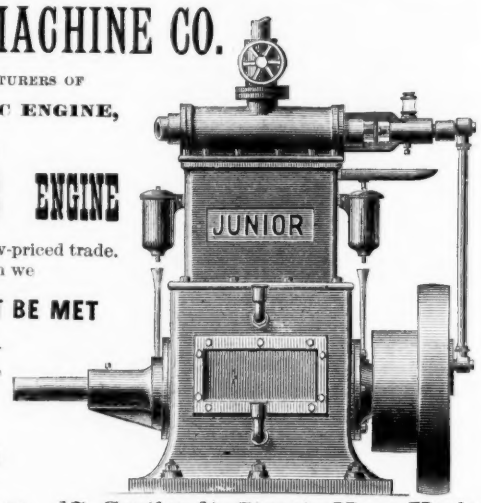

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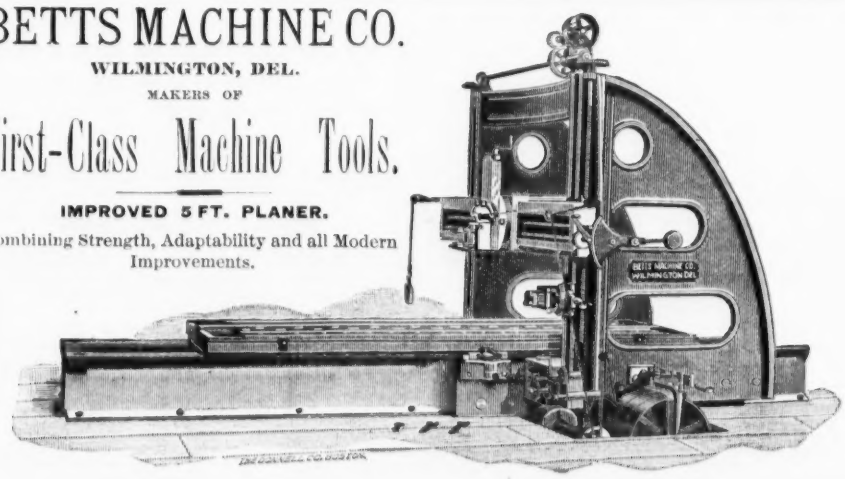

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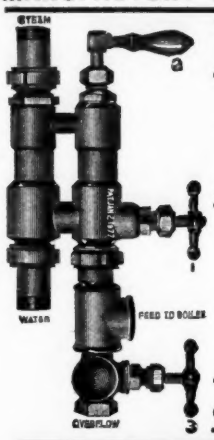

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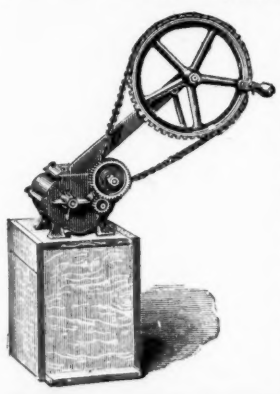

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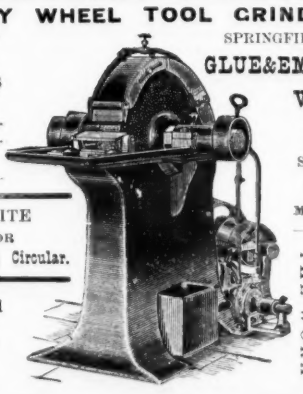

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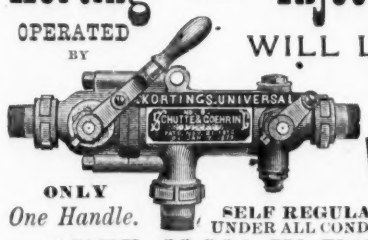

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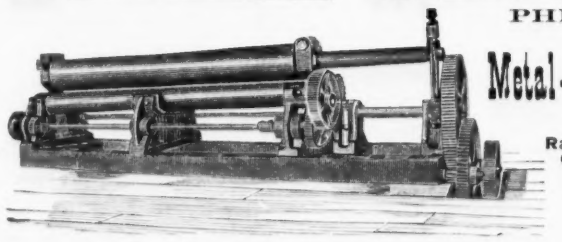

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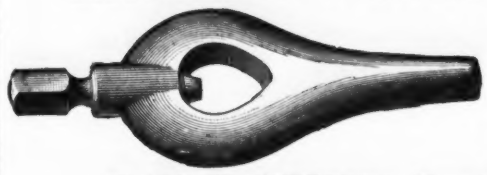

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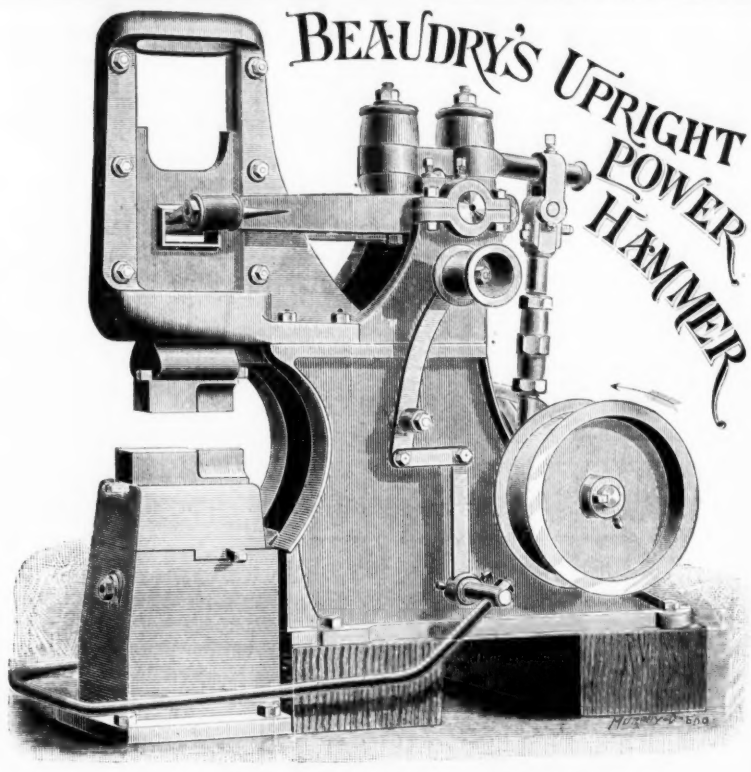

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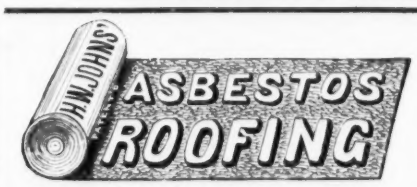

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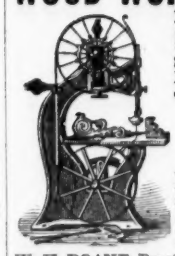

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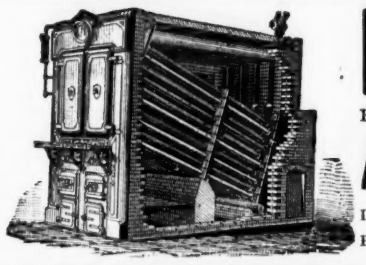

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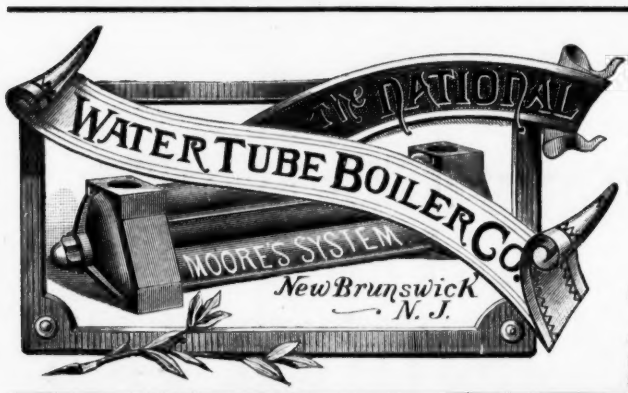

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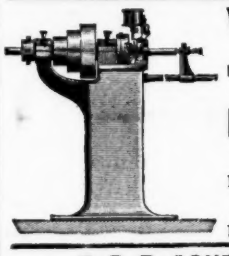
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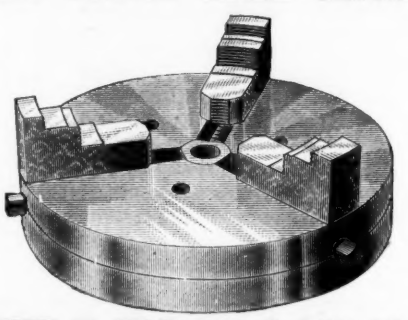
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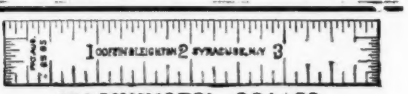

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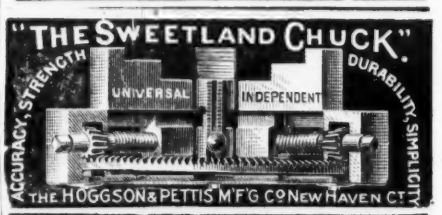

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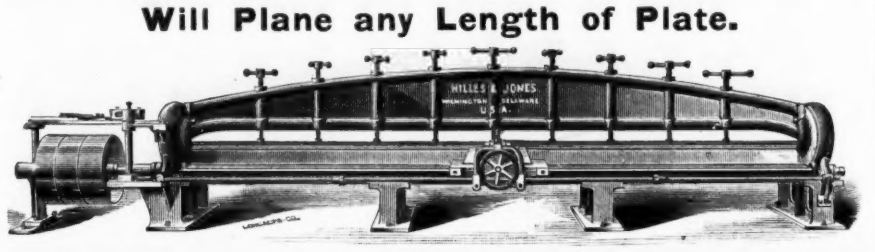

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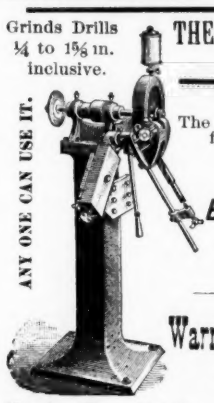

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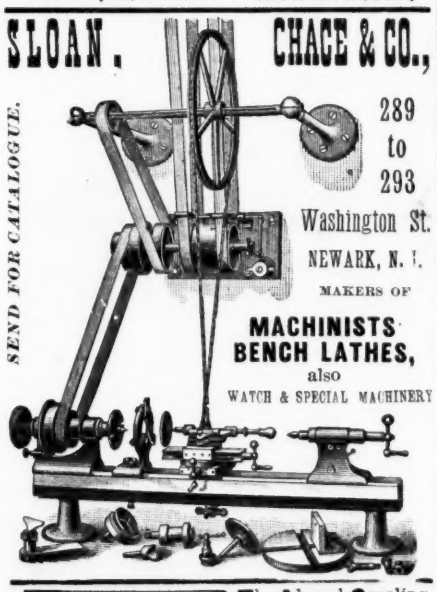

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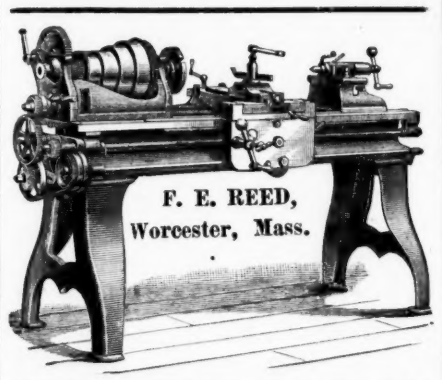

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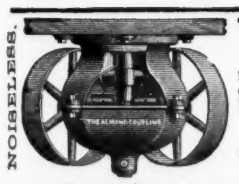

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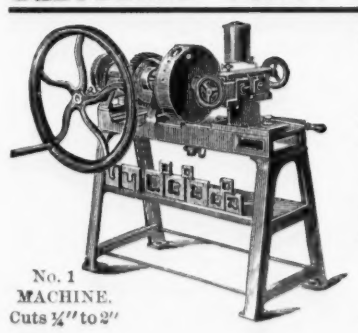

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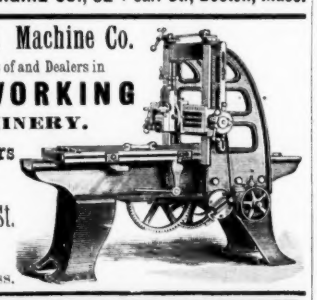

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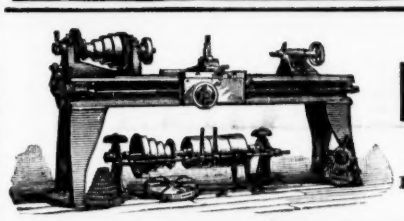

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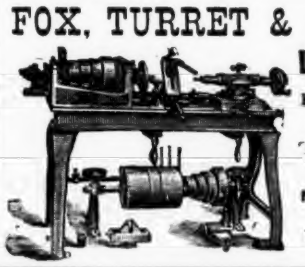

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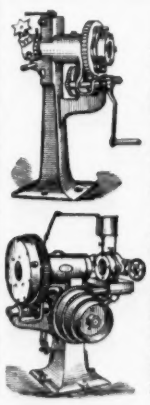

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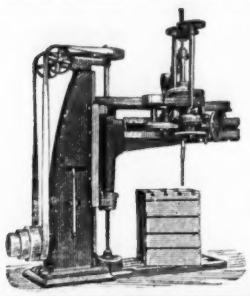

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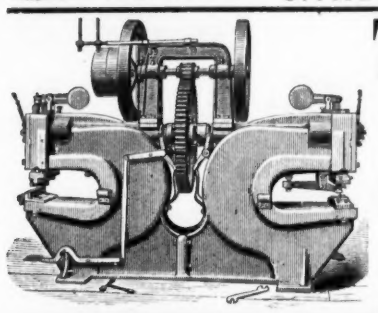

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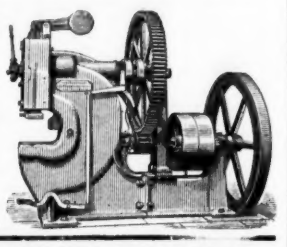

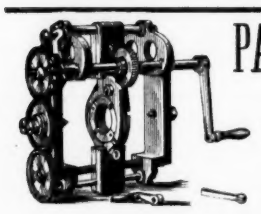

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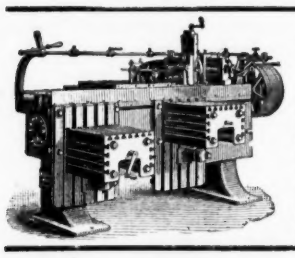

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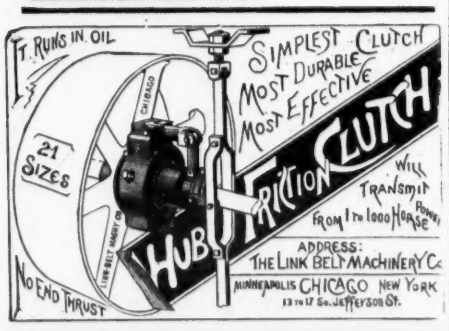

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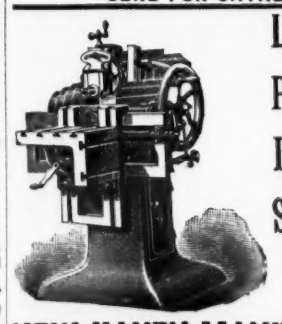

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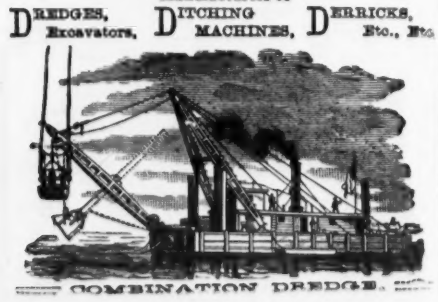

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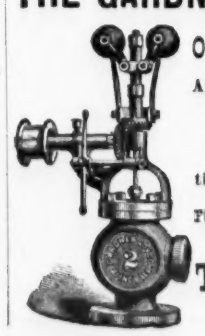

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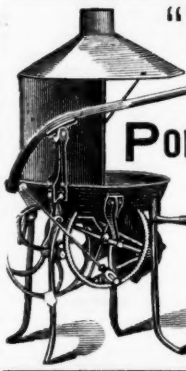

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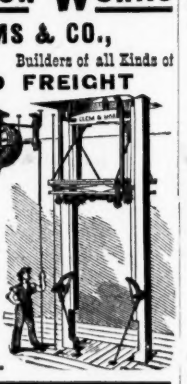

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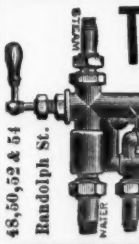

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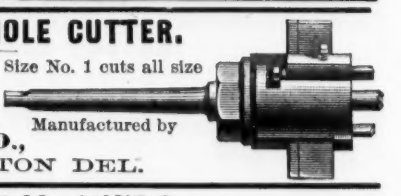

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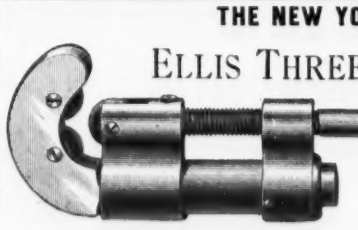

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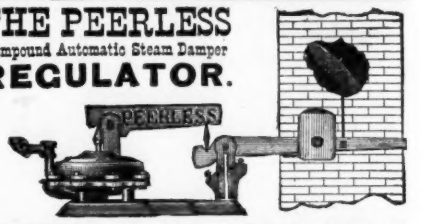

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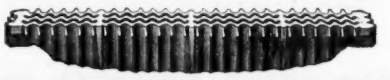

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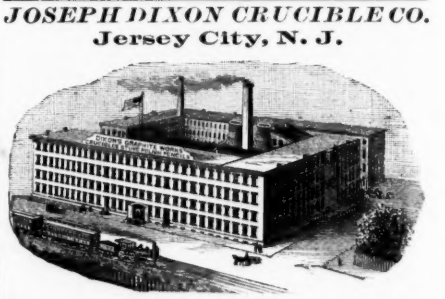

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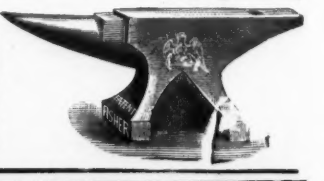

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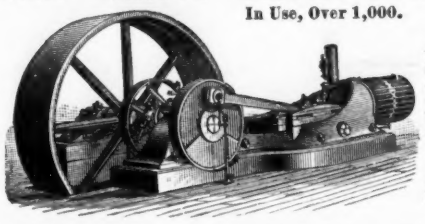

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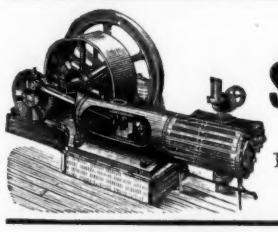

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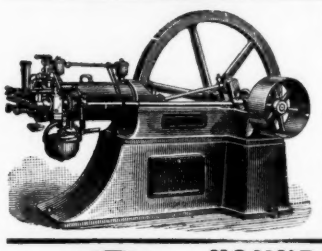

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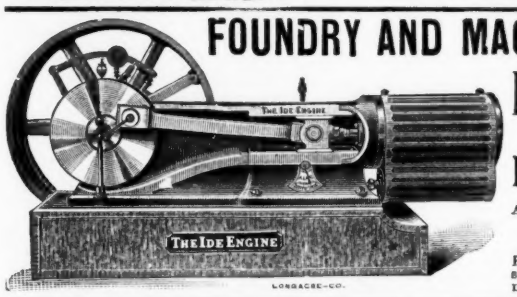

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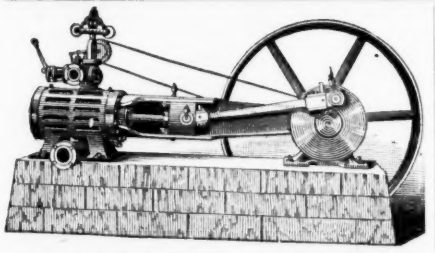

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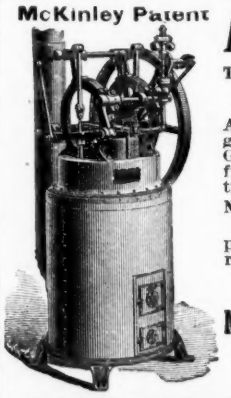

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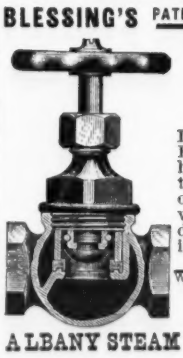

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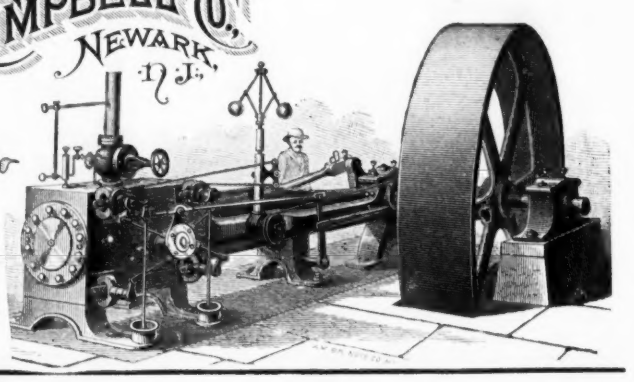

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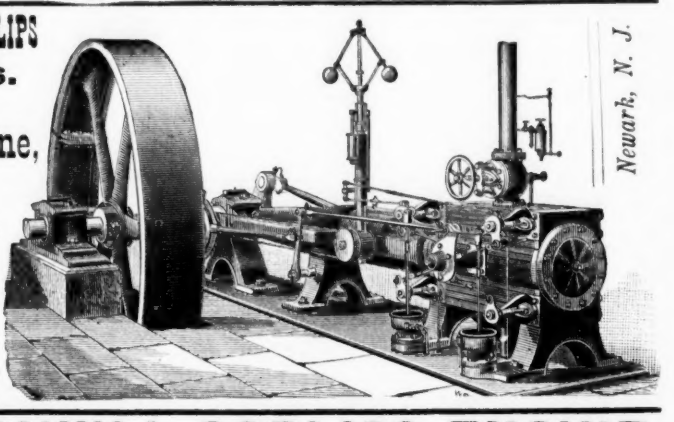

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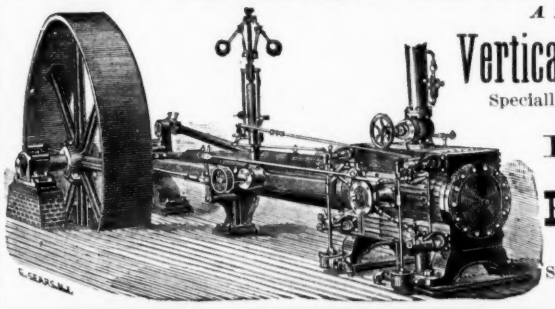

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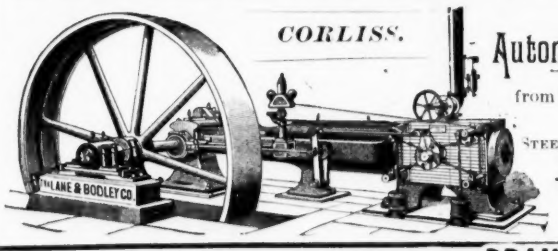

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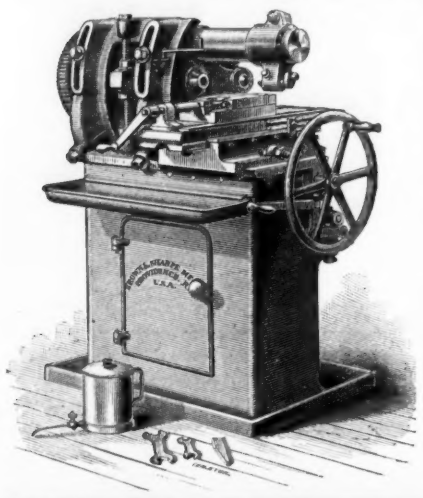

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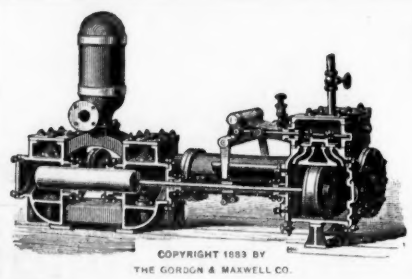

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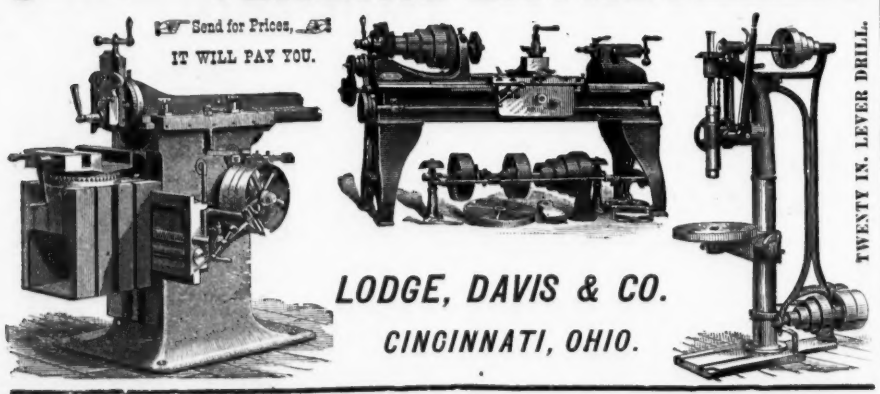

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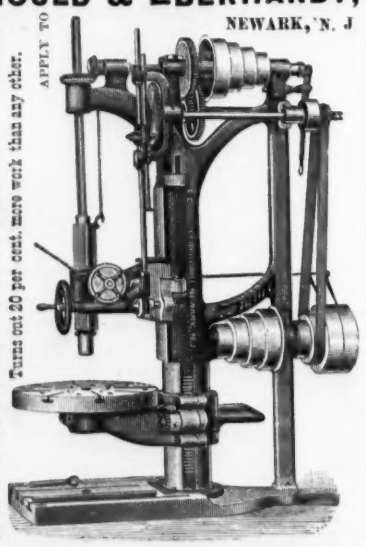

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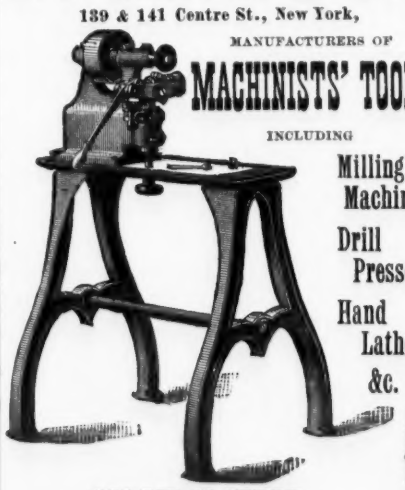

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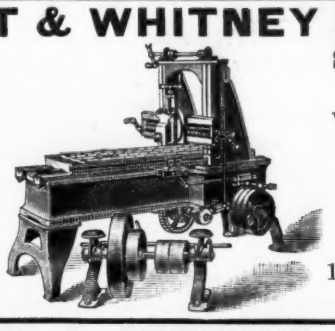

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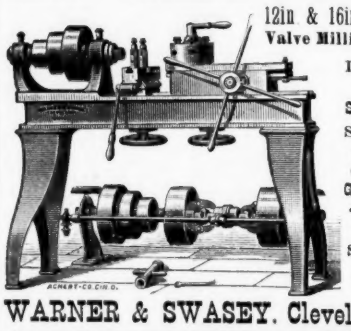

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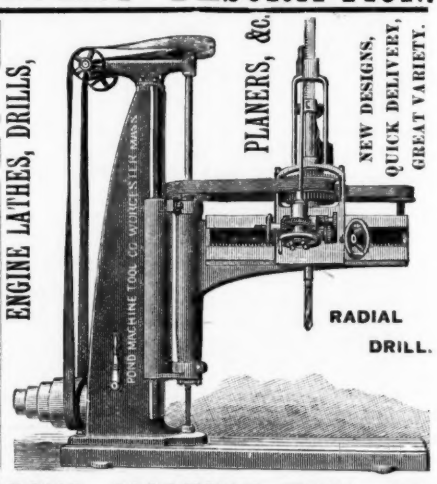

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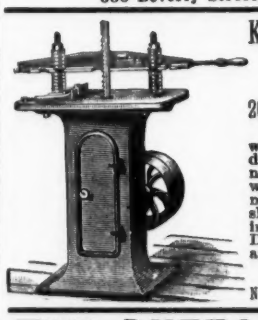

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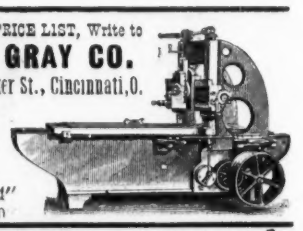

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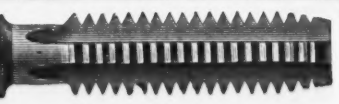

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